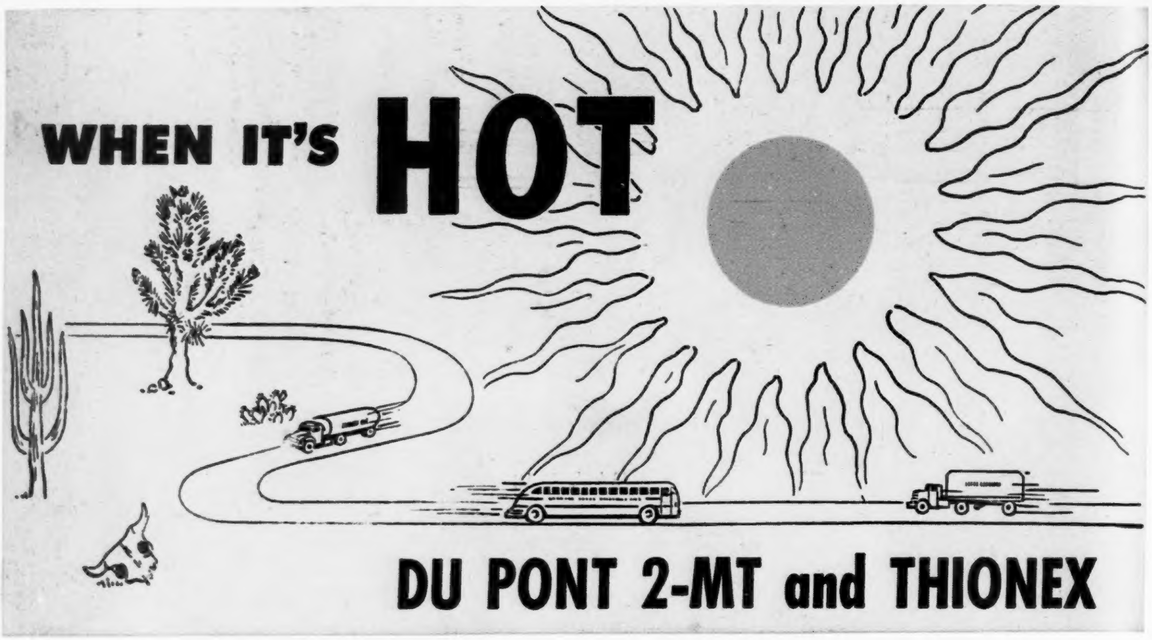
INDIA RUBBER WORLD

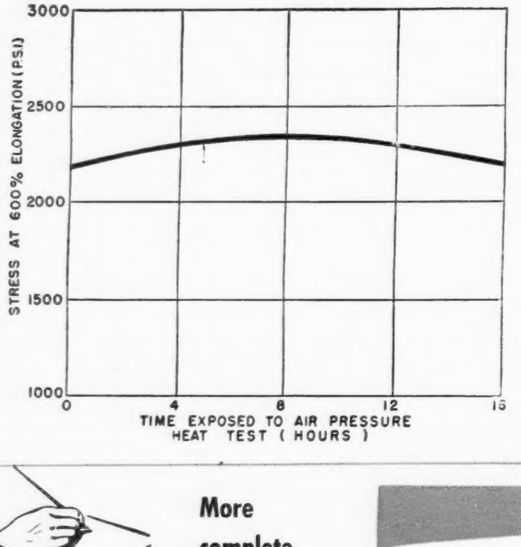
MAY, 1948



HEAT-RESISTING INNER TUBE COMPOUND

Smoked Sheets	100.0	Fine Thermal Carbon Black	40.0
NEOZONE A	1.25	Stearic Acid	1.0
AKROFLEX C	0.75	2-MT	1.75
RETARDER W	0.5	THIONEX	0.1
Zinc Oxide	5.0	Sulfur	1.0

EFFECT OF AIR PRESSURE HEAT TEST AGING ON A HEAT-RESISTING INNER TUBE COMPOUND EXPOSED IN CONTACT WITH A RUBBER CARCASS STOCK.

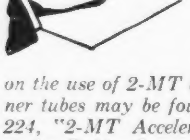


will protect inner tubes from reversion failures

INTER-CITY trucks and buses are hard on their inner tubes. For sustained periods of time these inner tubes may operate at temperatures in excess of 250°F. Under such service conditions, adequate retention of physical properties requires protection against reversion. The use of 2-MT acceleration, activated by a small amount of Thionex, will result in increased heat resistance with consequent improvement in tube life.

Test data shown graphically at left for a typical high quality natural rubber heat-resisting inner tube compound show that 2-MT-Thionex acceleration *protects against reversion.* To simulate service conditions, this compound was exposed to the Air Pressure Heat Test in intimate contact with a typical rubber carcass compound. Even after 16 hours in the Air Pressure Heat Test there was no tendency toward reversion as judged by stress at 600% elongation.

Tune in to Du Pont "Cavalcade of America," Monday Nights—NBC Coast to Coast



More complete data . . .

on the use of 2-MT and Thionex in inner tubes may be found in Report BL-224, "2-MT Acceleration for Heat-resisting Rubber Inner Tube Compounds." If you would like an extra copy, write:

E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.

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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

INDIA RUBBER WORLD, May, 1948. Vol. 118, No. 2. Published Monthly by BILL BROTHERS PUBLISHING CORP., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada, $4.00; All Other Countries, $5.00; Single Copies 35 cents. Address Mail to New York Office.

TWO NEW PLASTICIZERS FOR VINYL RESINS

New Hycar Nitrile Polymers make processing easier and widen fields for makers of many products

THIS news is important to any company dealing in any way with the vinyl resins. The new Hycar EP (easy processing) and Hycar NS (easy-processing, non-staining) offer exceptional advantages. These are nitrile rubbers that really *blend* with the vinyls. Check these properties:

★ **PERMANENT CEMENTABILITY**—because these plasticizers are non-migrating and non-volatile. (Of vital interest to any manufacturer of products requiring cemented construction.)

★ **STABILITY**—won't get brittle, won't evaporate.

★ **NON-MIGRATING**—won't soften or pick up varnish.

★ **EASY PROCESSING**—and a more perfect blend either on a mill or in a Banbury. Calenders and extrudes *smoothly.*

★ **HIGHER LOADING**—economy in products where the price per pound of the compound is important.

★ **WIDER LATITUDE**—in color and color stability, particularly with those hard-to-do pastels.

Our service bulletin, 48-H1, on the use of the new Hycar American Rubber with the vinyl resins, will be sent on request. We make no finished products from Hycar or any of our other raw materials, but we are glad to help in the development work on any special applications. Write Dept. HA-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar

Reg. U. S. Pat. Off.

American Rubber

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Yes, Philback O is a marvelous aid in obtaining a long and trouble-free life for your tires. Give your tires this desirable quality by using this black magic!

And if you require some other particular property in your product . . . if you have a special rubber problem . . . please feel free to consult our technical staff.

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to prevent scorching, and for recovering
scorched stocks
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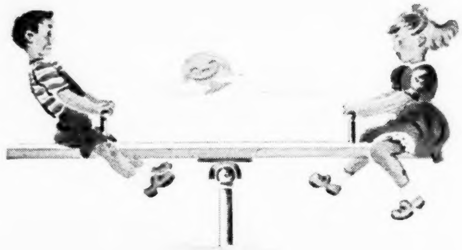

Greater Stability! A polyvinyl chloride-type resin of high molecular weight, Marvinol offers superior resistance to heat, light and other normally destructive factors.

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Broad Temperature Range! Products made from Marvinol resins show less heat deformation than other resins . . . offer positive advantages in low temperature flexibility.

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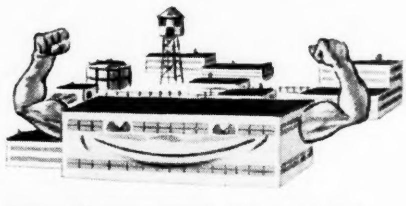

Ultra-Modern Plant! New Marvinol plant contains latest equipment to assure efficient operation, uniform product, highest quality. Production quantities of Marvinol resins are now available.

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An Ounce of Prevention...

"DOC" MacGEE SAYS: As a user of industrial solvents, would you go ahead and turn out inferior products due to inferior solvents if you knew it could be avoided? Would you permit your plant to shut down temporarily (and lose money for you) simply because your solvent supplier failed to make delivery on time . . . if you knew it could be prevented?

Of course not—and yet are you taking every precaution to make sure such things *don't* happen? Did you know that SKELLYSOLVE reduces such risks to an absolute *minimum?*

It's an established fact, known today by users in every field of industry. Some of these plants have had unfortunate experiences with "cut-price" sources of supply. They know the value of Skelly dependability in quality, delivery, and technical service.

SKELLYSOLVE stands for highest quality solvents that never vary. SKELLYSOLVE stands for purity, close boiling ranges, and freedom from foreign tastes and odors. SKELLYSOLVE stands for complete reliability of delivery . . . in the full amount and the time specified.

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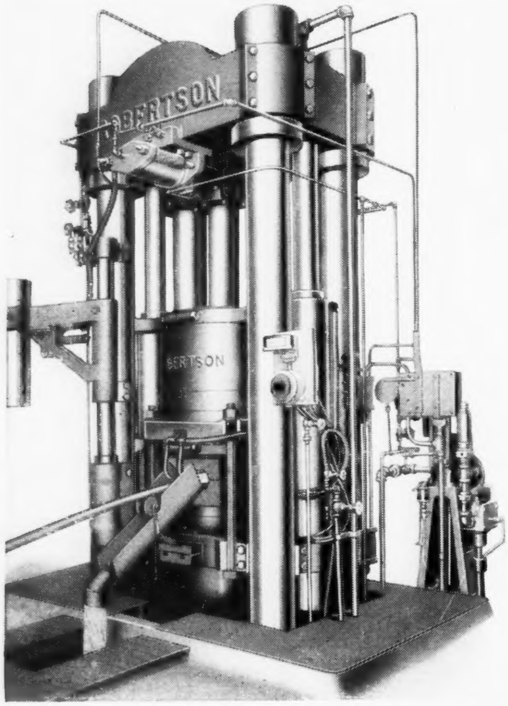
HOSE LEAD ENCASING PRESS

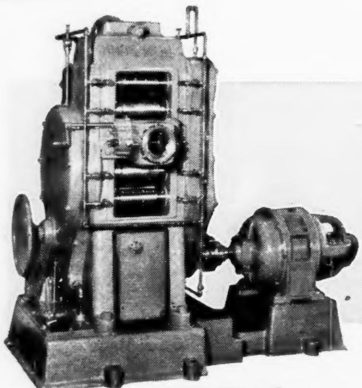
by Robertson



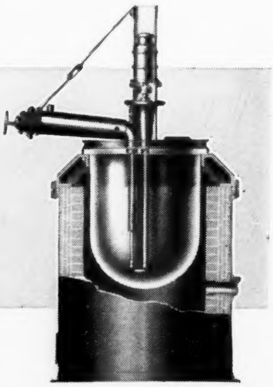
You can depend on it to maintain uniform, steady output of quality lead sheath . . . with minimum operating and maintenance costs. That's why Robertson Hose Lead Encasing Presses are the choice of such leaders in the field as — Goodrich, Boston Woven Hose, U. S. Rubber, Goodyear, Dunlop, Gates, DeVilbiss and a host of other producers of quality products.

Our more than 89 years' specialization in the design and manufacture of high pressure hydraulic equipment is at your service to help you solve your lead encasing problems. Consult us . . . no obligation, of course.

We also design and build Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Lead Sheath Stripping Machines and Hydraulic Equipment for Special Uses. Write for details.



Lead Sheath Stripping Machine



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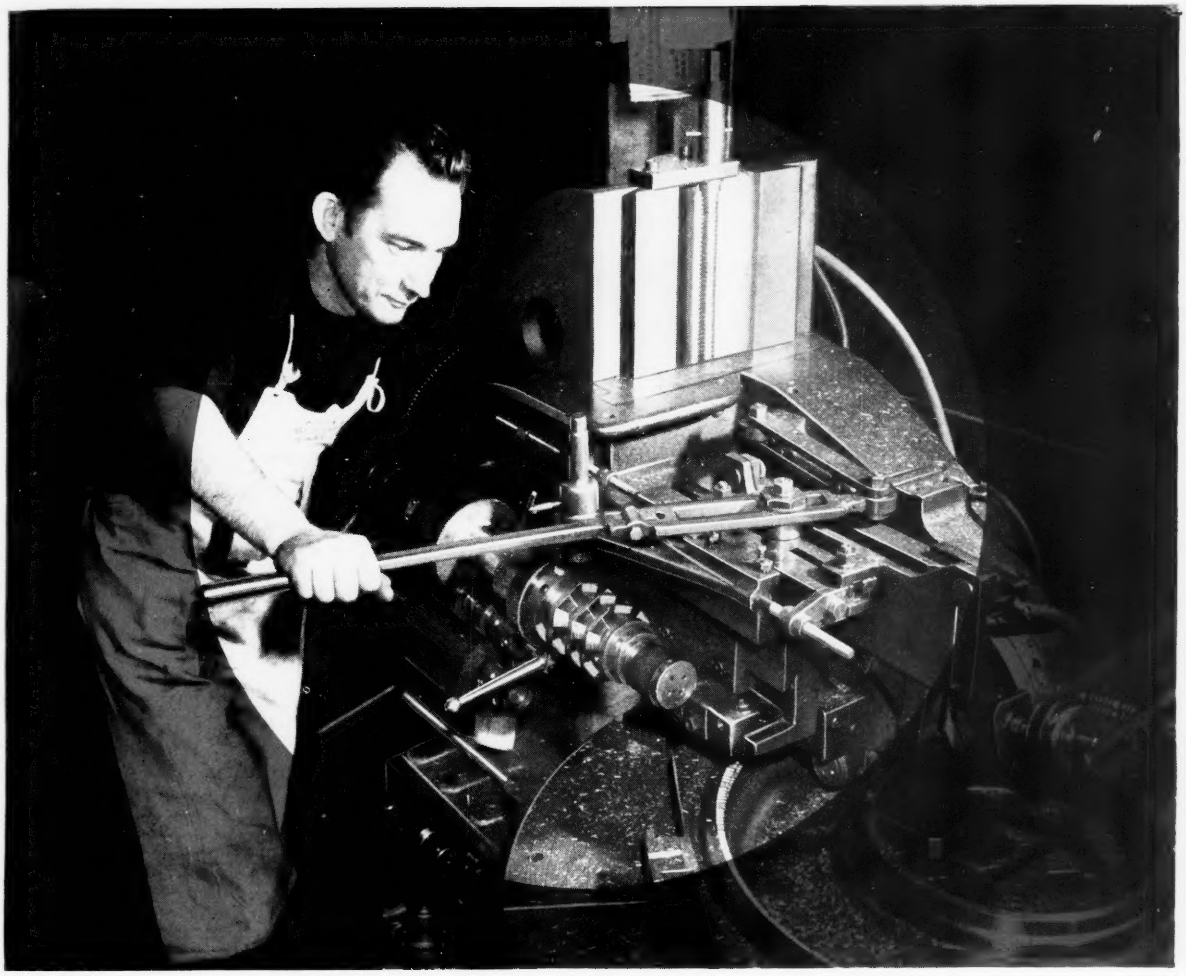

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SEVERAL years of research and development in the laboratory and pilot plant indicated that propionic acid treated* Zinc Oxide had several properties particularly desired by compounders of rubber.

From 1941 to 1946, World War II prevented wide introduction of this material.

Since 1946, this Zinc Oxide–until now known as XX-166–has been subjected to large scale plant tests in a variety of compounds. The fact that it speeds production, improves quality, and saves money has led to its adoption by a number of manufacturers.

Now this pigment takes its place in the regular line of New Jersey Zinc quality Zinc Oxides–but under a new name, PROTOX-166. We believe that on its merits PROTOX-166 will soon become one of the most widely used Zinc Oxides in the rubber industry.

**U. S. Patents 2,303,329 and 2,303,330.*

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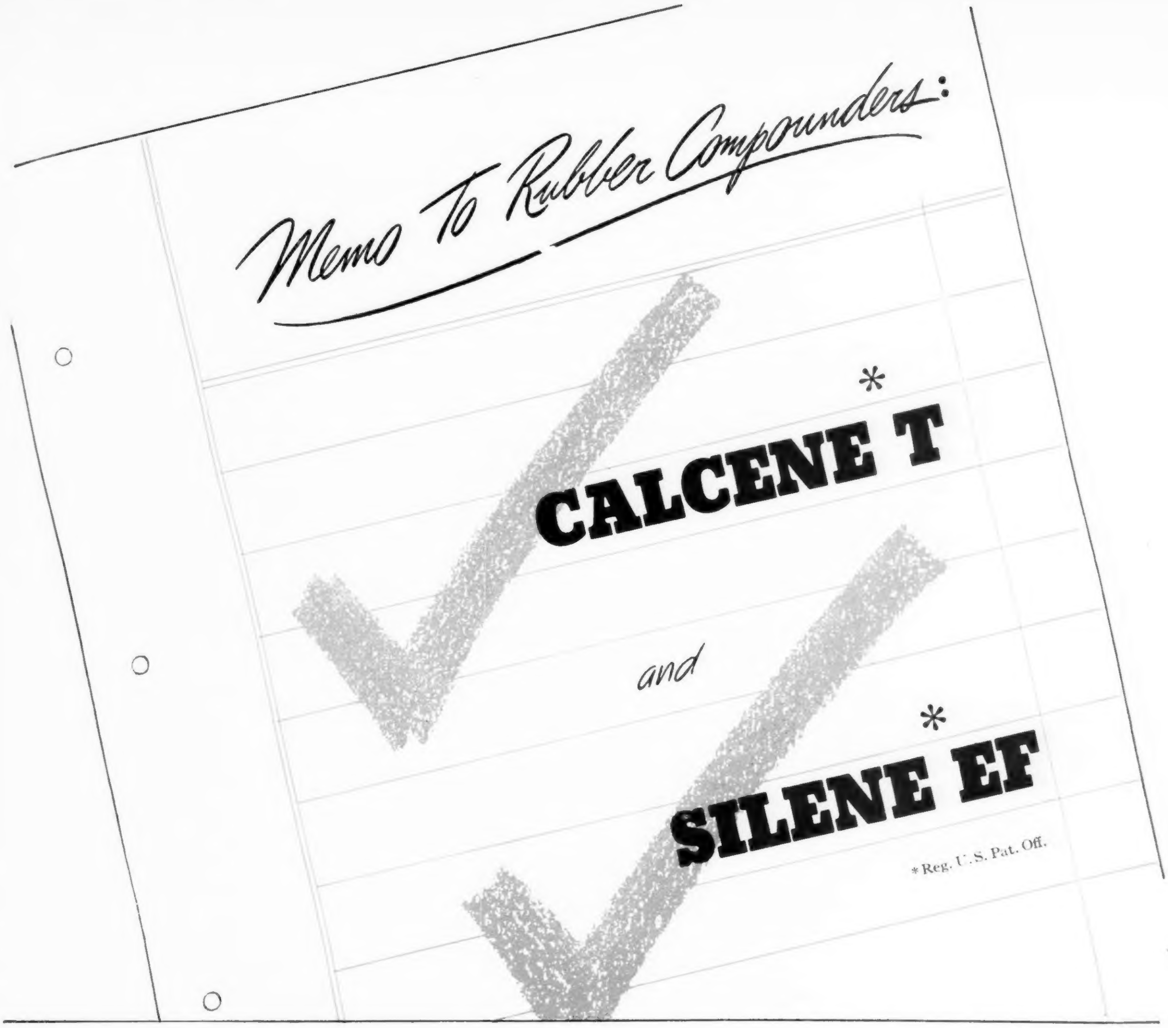

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Calcene* T—A specially prepared, coated, precipitated calcium-carbonate of fine particle size—confers high tensile strength, resistance to tear and abrasion, low modulus, smooth, fast extrusion and good general processing properties to natural and synthetic rubber stocks. A pigment of wide utility solving many compounding problems.

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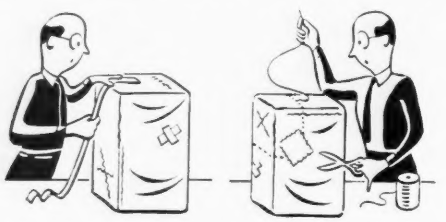

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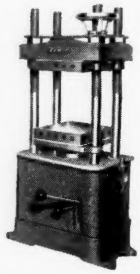
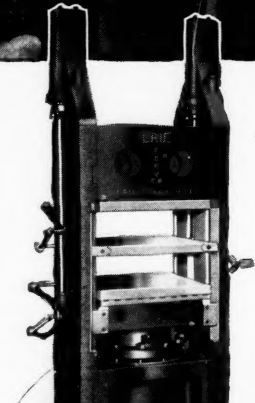


300 TON ERIE
Hydraulic Presses



Versatility in Rubber Molding

IN one of the Rubber Industry's largest plants, these 10 Erie 300 Ton Hydraulic Presses are molding a multitude of rubber products. Each Erie press shown here has four 3 ton pushback cylinders. Main rams are ground from chilled iron. Pushdown rams are of stainless steel. All glands and guides are bronze. Each press has two 6 inch openings and 24 inch by 24 inch platens. Nearly a half-century of engineering "know how" in designing Erie Foundry Company hydraulic presses is matched by unexcelled craftsmanship in producing this equipment for the rubber and plastics industry. Let Erie Foundry Company Engineers consult with you on your hydraulic press problems. Bulletin 350 gives full details on Erie Foundry Company Hydraulic Presses. Write for it.

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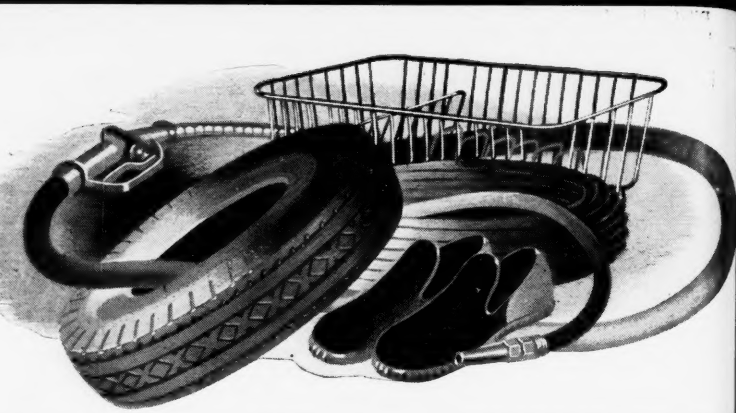
KOPPERS

Offers the Rubber Industry



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—as a raw material for the production of rubber-processing chemicals such as antioxidants and peptizing agents

ALPHA-METHYL STYRENE
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Calender Assembly Floor, New Castle Plant.
24" x 68" Std. 4-Roll Calender in foreground . . . three Precision Type 4-Roll Calenders in background.

For sheeting unsupported Plastic Film

These entirely new Calenders produce film of varying thicknesses ranging from extremely low gauges up to rigid sheets. They permit higher and more uniform roll temperatures so that wider sheets can be calendered. Uniform gauges across width of sheet are maintained with no change in roll crown.

THE NEW 24" x 68" STANDARD 4-ROLL CALENDER

This modern unit is ideally suited for the manufacture of standard types of unsupported film and for the coating of fabrics. It is capable of producing the finest quality product at high production speeds. Some outstanding features are:

- **High capacity drive direct-connected to center roll.**
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- **Precision roll adjustment.**
- **Pre-loaded adjusting screws.**
- **Rugged frame; oversize bearings.**
- **Compact floor arrangement.**

ALSO A NEW PRECISION TYPE 4-ROLL CALENDER

Carefully selected and pre-loaded roller bearings support the rolls with no bearing clearances and are adjusted for high temperature operation. Hydraulic jacks positively position the bearings against the adjusting screws. Precision Cone Worm reduction units and individual motors operate each adjusting screw.

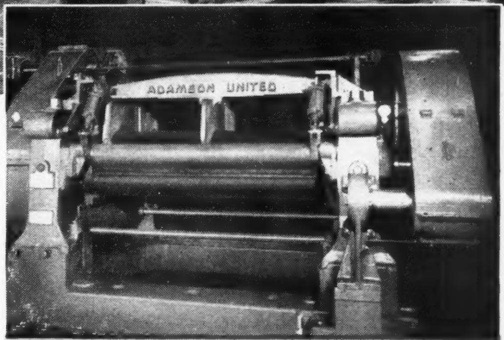
Rolls are separately driven from a gear stand through universal couplings, allowing free adjustment without disturbing the position of the gears. These operate in a separate case, and on fixed centers, so that teeth can be cut with a fine pitch.

The *Roll axes are crossed* by a special cambering attachment. This compensates for roll deflections due to varying stock plasticities or Calender speeds, and avoids the necessity of re-grinding rolls to different crowns for any of these changing conditions.

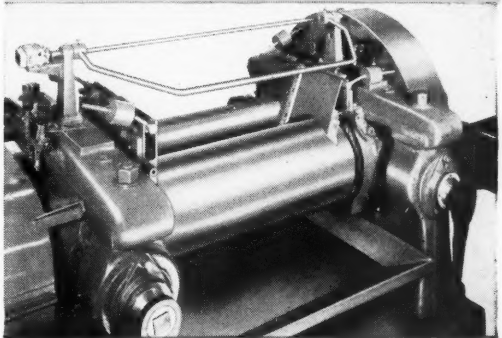
The rolls, with their anti-friction bearings, can be quickly detached from the universal couplings and removed from the frames. A special roll-changing device can be provided for this purpose.

We design and supply entire calendering process systems including all accessory equipment. To assure our customers the earliest possible delivery of precision-built plastics processing equipment, we have combined the facilities of six great plants, each operated by personnel with years of experience in the building of heavy machinery. From these plants the various components of steel and iron castings, gears, chilled iron rolls and other parts are assembled at New Castle.

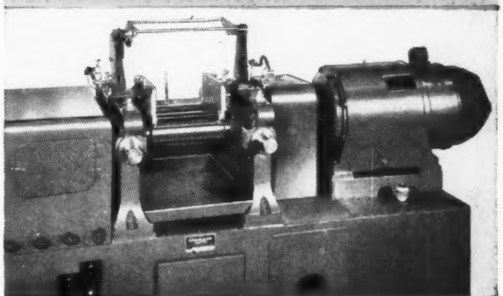
Complete details on the Calenders and Mills illustrated, or on any other equipment we manufacture, will be furnished on your request.



Modern 26" x 84" Mill equipped with self adjusting center guide and pneumatically operated roll scraper which can be moved against or away from roll by operation of foot treadle or hand valve.



New, Heavy-Duty 24" x 60" Standard Mill for mixing and blending raw materials prior to calendering. It is equipped with oil flood lubrication . . . triple oil seals on all bearings and tiltable, easily cleaned stock guides. Can also be furnished in 16" x 36" or 20" x 48" sizes.



Very late model 8" x 16" self-contained Lab. Mill incorporating many features wanted by research laboratories. Furnished on cabinet with all controls mounted flush on front cabinet panel. Has flood lubricated bearings . . . triple oil seals . . . tiltable stock guides. Can also supply in 6" x 13" or 12" x 24" sizes.

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FLINTKOTE *Products for Industry*

May, 1948

Volume 118 Number 2

A Bill Brothers Publication

INDIA
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INDIA
RUBBER WORLD

Volume 118 | New York, May, 1948 | Number 2

Recent Developments in Rubber and Plastics Machinery[1]

E. S. Thompson[2]

THE Philadelphia Rubber Group includes many of the technical representatives from companies engaged in the manufacture of many different kinds of rubber products, whose plants are located in this area. Many feel that this section of the country might well have been the rubber center of the United States and the world had not the effect of the growth of the automotive industry on rubber goods manufacture elsewhere been so pronounced. Nevertheless the diversity of products manufactured in this area, including the appreciable volume of output of automotive rubber goods still concentrated here, makes this section one of the primary centers of technological development.

The area was one of the first, if not the first, to recognize the tremendous potentialities of the plastics field. Perhaps more significant than the recognition of the possibilities of these new synthetic raw materials has been the realization of their probable effect on the rubber industry.

Finally, either because of Philadelphia's geographical location with respect to large centers of population or because of its strategic position adjacent to water transportation and highly industrialized areas, many new designs, processes, and even basic industrial philosophies have been pioneered in this area.

Some Problems in the Development of New Machinery

It is on this matter of basic industrial philosophies that I would like to dwell for a few moments. Without question, your speaker reflects the quandary of all heavy machinery manufacturers in the following general remarks.

We are continuously faced with the logical request to offer the very latest in machine design from the standpoints of quality, flexibility, and economical production costs. At the same time, however, and virtually in the same breath, we are requested to present proof of the satisfactory performance of the contemplated specifications for the new equipment.

It should be stated here that all manufacturers of machinery for the rubber and the plastics industries thoroughly appreciate the dilemma confronting either the small or large corporation with regard to the purchase of new equipment. In the case of the small or medium sized concern, a large capital expenditure which subsequently proves to be inexpedient may well jeopardize the entire financial stability of the company. With large organizations there is the tendency to evaluate individuals in the machinery supplier firm by specific results on a given project, which unavoidably leads to conservatism, and, also, there are unwieldy management procedures which require approval by those trained in other specialized branches of the company, who are therefore reluctant to accept responsibility for certain risks in a field foreign to their experience.

In view of the above facts a tremendous burden is placed on those charged with the responsibility of recommending new equipment involving any appreciable departure from the accepted process procedures. The degree of this responsibility varies widely with the attitude and approach of the customer. Some customers appreciate the fact that *no* progress can be made without some degree of accompanying risk. Such an approach permits a constructive analysis which may ultimately lead to common agreement on jointly accepting the responsibility for what has now been termed a "calculated risk." It is only with the danger of recriminations thus removed that progress can be made in other than tediously small increments.

Admittedly, certain circumstances favor this healthy relation between equipment suppliers and consumers. Some industries have consistently operated with a wider margin between their costs and selling prices than others. Possibly the chemical group considered as a whole is the best example of this situation. Such a condition makes increased capital available for research and development, and this, in turn, leads to new products and new progress which ultimately result in the position of eminence which some of these companies have attained. The availability of government funds or other forms of outside subsidy are additional factors which periodically permit unusual scientific advancement.

On the other hand we have certain industries which operate on very close profit margins, and under these conditions the accumulation of capital for new ventures is extremely difficult. In addition, other factors have had

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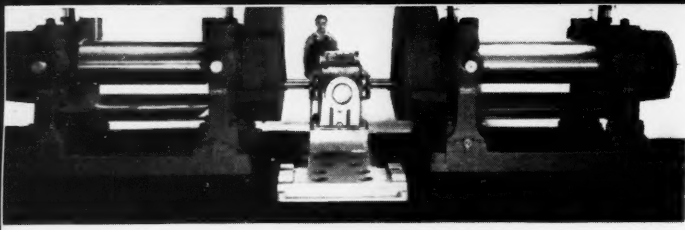
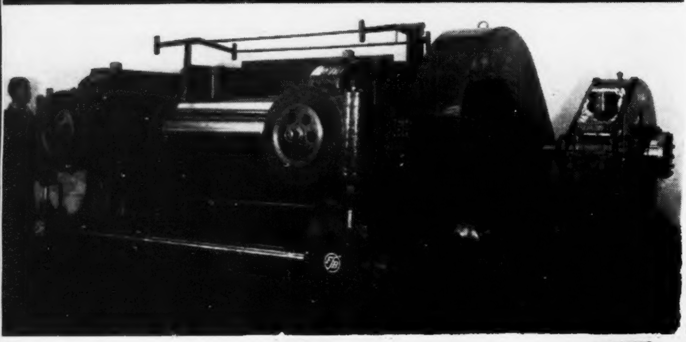




(Top)
Fig. 1. This twin-mill unit saves floor space by having one right-angle motor drive for both mills.

(Bottom)
Fig. 2. This 26- by 84-inch mill for sheeting the stock from a size 11 Banbury mixer has motorized roll adjustment, strip cutter, and swinging bank board over the rear roll.

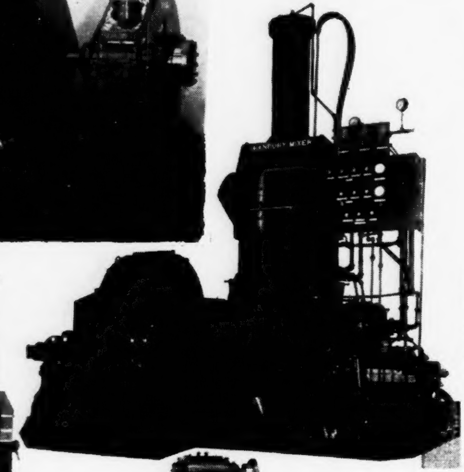
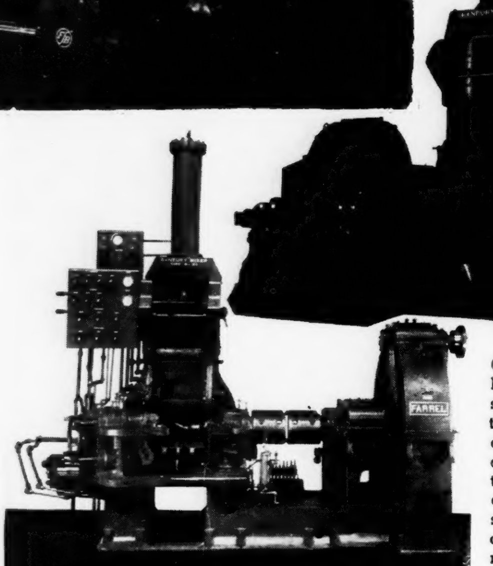


Fig. 4. Size 11 Banbury for mixing plastics, with closed circulating system, extended neck to provide extra space for bulky materials, and valves and gages for various temperature-regulating circuits mounted on panel at operating platform.



(Left)
Fig. 3. In this new-size 3A Banbury the sides swing open to facilitate cleaning of the interior. All gears are enclosed in a separate case and connected to the machine by universal couplings.

an increasingly detrimental effect on profit margins.

The continued excessive demands of labor, combined with increased recognition of the variability of the human element, which have occurred at a time when consumer resistance to higher prices and variations in quality are also on the increase, have necessitated immediate process economies and improvements, even at the cost of high obsolescence. We therefore find ourselves in a position where for one reason or another practically all industrial plants are faced with the necessity of process improvements which, in most cases, involve modifications to, and replacement of, existing machinery.

On the assumption that most of the problems leading to joint supplier-consumer responsibility for new designs can be worked out, there is still in many instances another major obstacle. Some industries (possibly the floor covering trade is the most outstanding) have long made secrecy one of their first lines of defense against competition. Such a policy has the effect of retarding development in at least three different ways:

1. Oftentimes the part to be played in the manufacturing process by the machinery in question is concealed by the customer to the extent that *known* design features cannot be incorporated.

2. The degree of success or failure of an installation is withheld when minor modifications dictated by analogous experiences on the part of the users of similar equipment would vastly improve performance for all manufacturers.

3. The final results, even as they pertain to general engineering information, are regarded as confidential and are thus lost to the fund of knowledge. Such a procedure deprives all users of rubber and plastics machinery, including any particular user in other instances, of the advantages to be gained from the economical design features possible only with adequate field test data.

It would appear that the tremendous capital investment involved, combined with the long potential life of heavy equipment, would dictate the relegation of competition in the rubber and the plastics industries to those items such as formulation, advertising, and merchandising, which have a less permanent effect on the industry as a whole. Fortunately, the existence and objectives of rubber and plastics groups, such as this one, and an increasing realization of interdependence between competitors within an industry are doing much to improve cooperation between machinery user and supplier. Let us hope that these trends continue and are further intensified.

Recent Developments in Machine Design

In spite of the above-mentioned factors which have made progress in the field of machine design difficult, progress has been made, and we will now proceed with an analysis of some of the advances that have been made in equipment for the rubber and the plastics industries. There is little justification for reviewing the history of rubber processing equipment over its 100-year history. By the admission of most qualified observers there was all too little progress during most of this span, and the reason for such stagnation is purely academic. The fact remains that, because of competition, overall economic conditions, or because of a comparison with the progress made in other industries, the rubber and the plastics goods producers now appear extremely receptive to new ideas. It is the responsibility of the machinery suppliers to direct this progressive attitude in such a way that returns may be realized and the way opened to that continuous cycle of development and expansion so essential to the progress of any branch of industry.

For the purpose of this discussion let us limit the study to that heavy equipment utilized in mixing, such as internal mixers and mills, and that used in forming the intermediate or finished product, such as calenders, extruders, etc.

The Two-Roll Mill

The two-roll mill was for many years the only recognized mixing equipment for extremely viscous materials.

Except for strengthening the basic design to meet the requirements of heavier loads, there has been little change in the original units for many years. Specialized applications, such as when the two-roll mill was used as a cracker, refiner, etc., required certain changes in fundamental proportions. The need of general overall economies, combined with accepted process layouts, has at various times resulted in trends toward individual units or line shaft operation.

More recently, we have come to recognize the importance of specialized designs to meet the specific requirements of a given application. The following are some of the factors which must be considered in addition to the purely mechanical questions of speed and power.

1. The conservation of space, particularly with new building costs at their present level.
2. The anticipated operating temperatures.
3. The importance of roll surface temperature control.
4. The necessity of frequent variation in roll nip opening.
5. The metallurgical requirements of rolls, guides, pans, etc., as determined by the chemical characteristics of the product being handled.
6. The probable frequency of cleaning.
7. The interrelation of the mill and other equipment in the complete process.
8. The possible desirability of variable friction ratio.

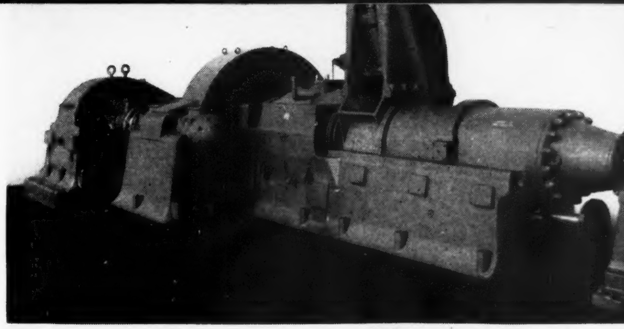
Where available space is a limiting factor, it is possible to offer right-angle, twin-unit right-angle, or group line shaft drives. (See Figure 1.) It is generally admitted that high operating temperatures (over 250-300° F.) dictate flood lubrication rather than the force feed type, together with increased bearing clearances and, usually, water-cooled journal boxes, if maintenance costs are to be kept at a minimum. In some cases the use of anti-friction bearings is also desirable.

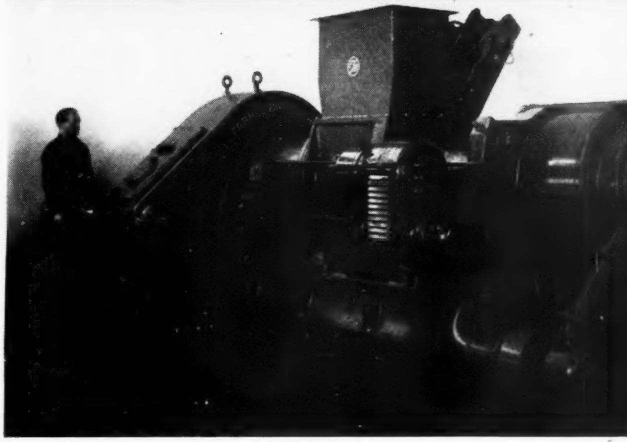
If roll surface temperature is extremely critical, as is the case with temperature-sensitive compounds or for the production of surface grain effects in flooring, a drilled-type roll should be used. The term "drilled-type roll" is used to designate a design which consists of a series of holes 1½ to 2½ inches, drilled below and parallel to the surface of the roll, which are then interconnected by a series of radial holes and cross ports. Such a system is used to circulate the heating or cooling medium and has the effect of reducing the "lag" in temperature changes, increasing the effective width or face of the roll, and reducing to a minimum the variation in temperature across the entire face of the roll.

Many instances have been found where the quality of the mix was improved and the production rate increased by varying the nip opening of the rolls during the mixing or warming cycle. To facilitate this operation, which is not feasible manually, motorized roll adjustment has been made available which can also be actuated by a timing device if the process permits. (See Figure 2.)

Some recent applications of the two-roll mill in certain plastic processes have necessitated chrome-plated rolls, stainless steel guides and mill pans, and other metallurgical modifications to prevent chemical corrosion. If cleaning is an important factor because of short runs or danger of contamination, certain other precautions, such as readily removable guides, may be incorporated.

Often a study of a process will indicate that the operation of two units in sequence is more productive than the same two units in line. This is particularly true when there are two or more stages of mixing best performed with different mill settings. When such is the case, it is often desirable to place one unit above the other to permit gravity flow of the material from the upper to the lower mill.





(Top)
Fig. 5. The 20-inch Gordon plasticator breaks down rubber with large savings in power, labor, floor space, and other operating costs.

(Bottom)
Fig. 6. The Hale pelletizer transforms rubber into free-flowing pellets which cut handling costs and improve uniformity and quality of product.

In some mixing processes and more frequently in laboratory or pilot-plant work, the ability to vary mill surface friction ratio is necessary in order that the effect of such variation be known. For such installations, units are available with individual variable speed drives on each of the rolls.

These examples of design modification have been given for the purpose of pointing out the desirability of first establishing *performance specifications* before selecting a mill. Failure to establish such specifications in advance may penalize an operation unnecessarily and certainly is not conducive to advancement in design. We hasten to point out here, and it applies equally to other types of units which will be discussed, that there is a logical compromise in this matter of specialization. It is the aim of every reputable machinery manufacturer to standardize the basic parts of each unit. This standardization is absolutely essential to minimize development engineering, pattern cost, and spare parts servicing. Our aim is the production of a standard basic unit to which additional special refinements may be added at a minimum of expense and lost time, originally or subsequently as the application may dictate. In the interest of all concerned "another solution" to a problem already solved in a satisfactory manner, should be avoided, unless by virtue of this further change in design a decided improvement appears possible.

The Internal Mixer

With the intensive internal mixer we find one of the first major improvements offered to the rubber industry in its entire history. The hundreds of Banbury mixers in operation at the present time and the continued unprecedented high-level demand for these machines bear

testimony to the advantage derived from their use in many operations. It is generally agreed that the Banbury mixer is one of the most versatile pieces of equipment ever developed, and the scarcity of available units justifies this opinion. As manufacturer of the Banbury, the intensive batch-type mixer, and the Gordon plasticator, the first intensive, continuous mixer, we are constantly faced with questions as to their respective fields of application. The answer is, of course, that they both have their own field.

In our estimation there can be no consideration of continuous mixing machines within reasonable limits of capital investment unless we can assume a feed of relatively homogeneous nature. Expressed in another manner, it is *usually feasible* continuously to mix and/or use a preblended mixture of raw materials in which each cubic inch contains all ingredients in the proper proportions. It is definitely *not feasible* thoroughly to disperse minute amounts of ingredients (such as minor pigment components) not already uniformly distributed through the major component. Thus, if the application presently planned or contemplated at any time in the future involves any possibility of non-homogeneous mixes, a Banbury is essential for such mixing.

There have been and will continue to be changes in Banbury design to make this unit adaptable to new applications, to decrease maintenance, and to facilitate plant housekeeping. With the use of the Banbury for mixing plastics, clearances were altered, the charging neck was extended for bulky compounds, special metallurgy was involved, such as chrome-plating certain parts, and the design of the discharge door was changed to permit better sealing and to avoid sticking resulting from greater expansion of the metal because of higher operating temperatures. Several units of new design which incorporate swing opening sides to facilitate cleaning are now in the field and being tested. (See Figures 3 and 4.)

Metallurgical research is being carried on constantly to develop metals and alloys for use in Banburys employed in operations involving abnormally abrasive stocks, such as for phonograph records and asphalt tile. Besides work on improved hard-surface materials, tests are being conducted on replaceable inserts and on special Nihard castings for points subjected to greatest wear.

Unit-type drives, which remove the connecting gears from the Banbury proper and incorporate them in the reduction unit, have been designed and built for several models. These drives have been very favorably received by the users, and a study to reduce the cost of the unit-type drive is now under way. For less severe operations a compromise which calls for hardened connecting gears at their present location with the possibility of flood lubrication into the "bite" by means of an oil circulating pump is being investigated.

Improvement of dust stops is receiving special attention in order that improvements as modifications to installed units may be offered. The use of anti-friction bearings is being tried out, and modifications of the lubrication system of the Banbury have been under investigation for some time. One complete new design of Banbury is now being tested for the first time, and, as many of you know, extensive tests of the Banbury as a means of reclaiming rubber mechanically have also been under way for a considerable period. Those in the reclaim industry who have a particular interest in this development will be kept posted on the progress of the work and have free access to the Derby laboratory where tests will be arranged at their convenience on application.

Summarizing the foregoing, the Banbury now enjoys a recognized field of application, and progress in design improvement will be limited only by the time required for field testing and the cooperation of the rubber and the plastics goods industries in presenting new problems and assisting the machinery supplier in the evaluation of this unit as a possible solution to these problems.

Continuous Screw Mixer

The present-day trend throughout the entire industrial field is to demand continuous processes. This demand is a logical outgrowth of the realization that the related problems of material handling, process control, and elimination of the variability of the human element are greatly simplified by making manufacturing processes continuous, whenever and wherever possible. The chemical industry as a whole and the petroleum division in particular have long recognized this fact, and their emphasis on extensive research and their willingness to make large capital investments for continuous processes are evidences of the value of this-type processing to these industries.

The Gordon plasticator, as shown in Figure 5 originally conceived to break down rubber with less generation of heat, was the first of the intensive screw-type machines. In addition to its application in the rubber field, it is now utilized increasingly in many plastics operations. This machine has given outstanding performance when used with such plastics as polystyrene, polyethylene, and vinyl polymer and copolymers, as a densification, pigmenting, or plasticizing medium. Since cleaning the plasticator presents some problems, long runs on the same compound by producers of basic resins is probably one of the most attractive applications of this machine. On the other hand, certain compounds have been found that are nearly self-cleaning, and satisfactory special mixtures have been developed for cleaning the machine after running other compounds.

More recently, other intensive screw-type continuous mixers have become available, some of which are based on the European design developed in Germany and Italy prior to and during the war. This design attempts to overcome the appreciable thrust on large units of this type by using two screws, feeding from both ends and discharging in the center, thus neutralizing the thrust except for discrepancies between loads in the two sections.

There is no question but that there will be an increasing demand for this type of mixing operation. Its limitations will be dependent on the development of suitable preblending equipment and the stabilizations of formulae and production. Large-volume producers and those desiring an extruded end-product will have the incentive for pioneering the development of the use of this type of machine.

Any study of recent developments in processing equipment and particularly with regard to screw-type mixing machine, would be incomplete without reference to the Hale pelletizer. This unit, shown in Figure 6, was developed primarily to eliminate the expensive and obsolete method of handling rubber in slabs, strips, or other hard-to-manage forms. Consisting of a special screw machine equipped with a cylindrical discharge head with radial orifices around which a knife cage rotates, this machine takes the discharge directly from a Banbury and converts the mix into an easily handled pellet form, slightly larger in size than a lead pencil eraser. The pellets may be conveyed mechanically or pneumatically to storage or subsequent operations. Carried to the ultimate, this unit permits masterbatching, pelletizing, automatic handling, proportioning, blending of stocks, remixing and warming, all without the necessity of *any* manual operations or exposure to the atmosphere and with resultant improved control, cleanliness, and decreased cost. Already installed

for some years in the large plants of the major tire companies, this machine is finding increased acceptance in smaller plants and in speciality fields. New uses include the fields of flooring and loaded plastic compounds. Any long-range improvement or cost reduction program by rubber and plastics goods manufacturers should give consideration to an evaluation of this process.

Another development in continuous mixing has been the so-called German mixer, shown in Figure 7. This machine has long been accepted in the linoleum industry as standard equipment where it serves to complete mixing after an initial batch treatment and where it is used to obtain maximum dispersion before other operations eventually leading to calendering. This unit consists of a series of "live" or rotating knives passing through a mating series of "dead" or stationary knives, thus presenting a labyrinth passage to the stock as it progresses through the cylinder by virtue of a spiral on the live knives. The discharge takes place through a series of orifices in a so-called "tail plate," and the shaft may be equipped with a cut-off knife to shear the "doggies" to any desired length. Most recently, this unit has been used successfully on mixtures of preblended phenolic resin and paper rag stock and also on vinyl resins, plasticizer, and pigment.

Still another recent application of the screw-type machine is its use as a calender feeder. It has long been recognized that a mill, at best, produces a mix having an "average" temperature because of the exposure to the air of the outside surface of the sheet and because of the large bank, which is not being actively mixed except for the small roll in the nip. To insure complete thermal equilibrium, a screw-type machine was developed with a suitable die to discharge directly into the first nip of a calender. Equipped with a variable speed drive, the extruder may be synchronized with the calender and only a small rolling bank maintained on the calender at all times. This procedure reduces the mixing load on the calender and should lead to higher production speeds. As an added feature, a strainer may be incorporated ahead of the discharge die to afford protection against metal contamination. Such a unit may be designed for direct feed from a Banbury, strip feed from a warming mill, or possibly even for use with pellets from storage.

Concluding this study of extrusion developments, many of these have been primarily a matter of intricate die design. There is the dual-head tuber which permits the extrusion of a tread-type stock with one die forming

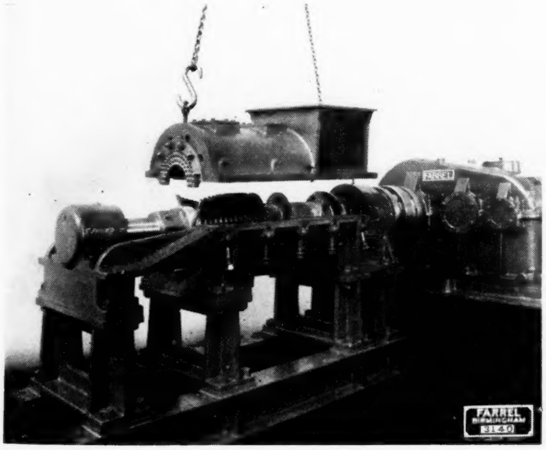


Fig. 7. The "German" mixer, long a standard unit in the linoleum industry, has been used successfully for mixing some preblended plastics stocks.

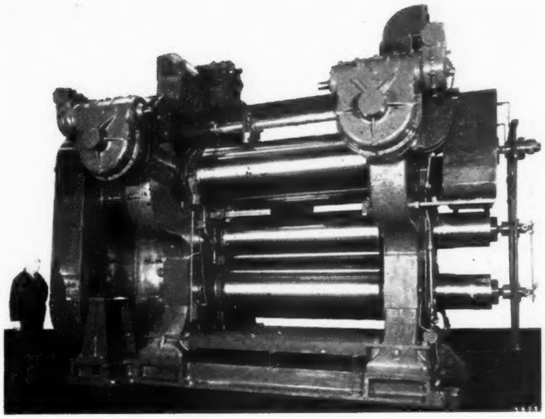


Fig. 8. The largest ever built for plastics film and coatings, this four-roll L-type calender has 32-inch diameter by 92-inch face rolls, with individual motor adjustment on each screw.

the tread and the other the sidewall. This operation is accomplished by using two opposed tuber units, each handling a different compound, but discharging through a specially channeled die so as to direct simultaneously each compound to the desired section of the product. Other special heads on more or less conventional units have been successfully used in the manufacture of plastic film, filaments, etc.

Calenders

Calenders, together with some extrusion units, are used most frequently to form and "meter out" the finished product. In view of this critical function it is perhaps more important that the design of calenders be held to closer tolerances than in the design of any of the machines previously discussed. Variations of a few thousandths of an inch or ounces per yard, when applied to the tremendous volumes of stock processed on calenders, can well mean the difference between profit and loss for a manufacturing operation. Furthermore maximum speeds at the calender are more significant than elsewhere, since attendant labor cost is usually greater and capital investment higher than at other points in many rubber and plastics goods manufacturing operations. Finally, and perhaps of even greater importance, is the fact that trouble-free, continuous operation and the minimum of maintenance effort at the calender are imperative because standby equipment is less frequently available and interruptions disrupt material flow and "bottleneck" production.

In discussing calenders, it might be desirable to examine the accomplishments of more or less analogous unit operations in other fields. Paper production speeds despite increasingly rigid quality specifications have advanced from a few hundred feet a minute to between 1,500 and 2,000 feet a minute. Thin-gage steel within unbelievably close tolerances is being rolled at speeds of 4,500 to 5,000 feet a minute, as compared with 800 to 1,000 feet a minute a few years ago. It is undoubtedly true that many complicated problems block a similar advance in the art of calendering rubber, and a coincidental improvement in auxiliaries must probably be realized before any large production rate increases will be possible. Our failure to reach speeds of more than 150 to 200 feet a minute in calendering rubber offers one of the most challenging opportunities in the entire process equipment field. On the basis of a more or less superficial study it would appear that the capital, development, and determination which were so essential to success in

the other fields mentioned above have been lacking to some degree in the rubber field.

Only recently have even the known desirable features been incorporated in some of our new calender designs, and these only through the cooperation of the plastics industry. (See Figure 8.) For example, we have long recognized the desirability of larger and stronger units, precision type bearings, better lubrication, more sensitive gage control, more accurate temperature regulation, elimination of connecting gears and their resultant thrust, and proper synchronization with pre-calender and post-calender auxiliaries. The demand for a variable crown to compensate for fluctuations in separating forces over a wide range of product requirements has more recently assumed genuine significance.

Aided by the increasing recognition of opportunity and a spirit of joint responsibility for taking the "calculated risk" mentioned previously, much progress has been made in the past few months. There are three possible solutions to the problem of increased separating forces between the rolls of a calender brought about by stiffer stocks, higher speeds, and thinner gages, among other factors. The first of these is the incorporation of a suitable roll crown, but this has the decided disadvantage of being fixed and therefore correct for only one specific set of conditions. Any variation from the arbitrarily selected set of conditions results in inaccuracies.

The second solution is based on providing sufficiently rigid proportions to counteract the maximum visualized load without measurable deflection. A special two-roll unit with 48- by 84-inch rolls was recently furnished on this principle to produce at a maximum of 10,000 square yards an hour, as compared with previous speeds of 1,500 to 2,000 square yards an hour. Because of its size and other special features this unit sold for more than $200,000 exclusive of electrical drive, as compared with $10,000 to $60,000 for conventional units; yet its accuracy and lower production costs should amortize the cost of the complete unit in three to five years. The third solution, the so-called variable crown or crossed axis design, is being evaluated and will be discussed in more detail elsewhere in this paper.

There is some conflict of thought on the subject of bearings, but, regardless of the approach, there is definite recognition of the need of improvement, and application tests now in progress should make factual statistics available in the near future. The old, plain cast-iron journal boxes with Babbitt or stave liners are definitely obsolete, and new, improved sleeve bearings, such as Morgoil or comparable types, and anti-friction designs of the ball or roller type are receiving increasing acceptance.

Some feel that the anti-friction type of bearing offers the ideal solution in all cases, but others believe that highly specialized sleeve features are necessary for greatest accuracy, ease of maintenance, and uninterrupted production. One version of the sleeve type uses highly accurate main bearings with special provision for thorough lubrication which are supplemented by adjacent auxiliary bearings. These auxiliary bearings are preloaded so as to insure no change in the relative positions of the journal and bearing regardless of variations in imposed load. When supplemented by thermostatically controlled temperature regulation of the lubricant, this system has the advantage of counteracting accumulated tolerances in the complete assembly and of reducing the problems of accuracy to a single phase. As in previous cases of this type, there will undoubtedly be no universal solution, but rather two alternative designs based on the particular application. Anti-friction bearings may predominate where power is a major factor, temperatures are relatively constant, and stops under full load are common; while sleeve types may be preferred for maximum accuracy, operation over wide temperature ranges, and where continuity of operation is a paramount requirement.

Improved lubrication is absolutely essential to any design progress. Flood lubrication is generally regarded as desirable and is necessary for all models operating at elevated temperatures. As previously mentioned, such lubrication should be supplemented by thermostatic control of lubricating oil temperature. Large-capacity oil reservoirs, filters, adequate pumps, and protective devices to prevent operation during any failure in the system are other accepted features. Completely satisfactory oil seals are still a recognized problem on which we are concentrating our efforts. Materials capable of withstanding the high temperatures, and designs allowing for expansions as great as 0.020- to 0.030-inch, are two of the major obstacles. Ample drainage to insure free flow and prevent development of pressure at the point of sealing is also of great importance.

Gage control must be classified into the two major types: variations across the sheet or over the face of the roll, and variations along the length of the material being calendered. The former type is a function of roll shape and design and is therefore subject to the variations mentioned under the topic of roll proportions which result from "compromise crowning." The only solution appears to be the use of larger units having stiffer rolls and less variation in usage of the calender, or the use of the crossed axis feature in some cases. Variations in gage along the length of the material being calendered are usually caused by fluctuating operations conditions, such as changes in temperature, speed, bank size, formula of stock, guide setting, and others. Needless to say, all of these conditions should be maintained as constant as possible.

Where the separating force in any given "nip" closely approximates the combined weight of the upper roll plus the frictional resistance to movement and any downward force from the second nip load above, there is a tendency for the upper roll to "float" within the limits of bearing and journal box clearances. This condition may be remedied by the use of the preloading devices previously mentioned. The trend in roll adjustments is to motorize all finish gaging passes and, at such low speeds that the control may ultimately be "tied in" with continuous gage measurement, to achieve so-called "automatic gaging" without "hunting." One of the major factors retarding this development has been the lack of satisfactory continuous gaging devices, particularly where no contract with the calendered material is permissible. Several manufacturers have recently completed non-contact installations which show considerable promise.

Much in the way of temperature control can be gained by the use of drilled-type rolls as discussed under mills. The importance of operating technique cannot be overemphasized in this connection since large, inactive banks of stock or intermittent feeds cannot help but vary the temperature. Satisfactory temperature control can be achieved only when the feed is synchronized and continuous, with the stock appearing to "dissolve" in a small rolling bank. From the standpoint of mechanical design the greatest need is of adequate control of the heating or cooling medium. Sudden changes in the temperature of the medium are undesirable and even disastrous in the case of drilled designs. All of this appears to dictate the use of a single medium, such as hot water, oil, etc., in place of steam and water. A roll surface temperature measuring device is now being offered which promises to be a major contribution to the industry. The use of this device combined with the drilled-type roll and proper

valving which are also available, together with elimination of "over-correction" resulting from the use of two separate mediums, appears to bring this problem nearer solution than at any previous time.

Some also feel that the 180° exposure between successive nips of vertical stack calender rolls is undesirable because it necessarily results in a temperature gradient between the inside and the outside of the sheet being calendered. We all recognize that absolute thermal equilibrium is most desirable and for this reason, among others, the so-called "Z-type" calender has been developed. (See Figure 9.) With this system, as the name implies, the four rolls are arranged so as to eliminate any "floating" middle roll, reduce the exposure between successive passes to 90 degrees, and maintain heat balance to a greater degree by the "nesting" of the rolls. Many companies operating at high temperatures have now enclosed the calender to isolate it from extraneous drafts, with resultant improvement in both temperature and gage control.

It has always been recognized that connecting gears develop some thrust and that this is undesirable in improved designs. In addition the removing of these gears, while servicing the rolls, is both costly and time consuming. A substitution which has proved very satisfactory is the use of a pinion stand which followed the rolling mill approach by incorporating all gearing in a suitable lubricated special case. This not only insures better alinement and lubrication with resultant longer gear life, but also "cleans up" the calender, improves housekeeping, and facilitates maintenance and roll changes which may occur more frequently with high-speed operation. This is also a typical example of improvement which leads to still further advances since with connecting gears on the roll necks it would not have been feasible to incorporate the crossed axis principle.

With the use of a universal connection between the pinion stand and the rolls, it was decided to revive our investigation of the crossed axis as a solution to the demand for the variable crown. The European method based on a theory of incorporating wedges was unsatisfactory because it did not provide practical means of quickly and accurately varying the degree of crossing. By swiveling the boxes in the side frame windows and motorizing the control this potentially valuable feature has been made applicable to modern processes. Extensive field tests are now in progress and have already progressed to the point where the theory is proved and the fear dispelled of splitting the sheet or extruding the product to the ends. New models will undoubtedly incorporate increasing application of this principle.

Calender Auxiliaries

We now reach the point of recognizing the necessity of simultaneous development of the calender auxiliaries, such as wind-up, let-off, etc. Machinery builders have been increasingly forced to accept orders for complete calender "trains," first, because of the small concerns with few technical personnel, and, second, because of the desire on the part of the large companies to centralize responsibility for performance.

The first manifestation of this trend toward complete calender trains was noted in electrical equipment where definite justification exists because of the inter-relation of motors, drives, and output speeds. Furthermore the electrical distribution structure is such that no economic penalty was imposed on the user by so processing the order, and greater volumes of business for machinery builders sometimes resulted because of better liaison and expediting. These electrical trains as a whole have proved very satisfactory to all concerned and will probably become standard practice.

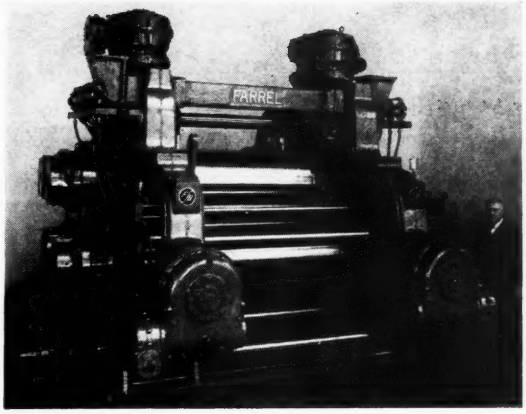


Fig. 9. In this calender the Z arrangement of the rolls provides, among other advantages, more sensitive gage control, more accurate temperature regulation, and variable crown.

When confronted with an expansion of this trend to light duty-equipment, conveyers, pipe and fittings, etc., the machinery manufacturers faced another dilemma. To offer this service virtually demanded the use of expanded staffs of consulting engineers experienced in all phases of production. The jealously guarded reputation of machinery manufacturers as impartial confidants would be jeopardized, and access to some plants might be refused, with its resultant effect on the accumulation of data and the policing of installations and operations of equipment. To date, experience has indicated that assumption of this new responsibility involves the heavy equipment supplier in continued contingent liability and requires disproportionate staff organizations. Performance in one customer's process is no criterion for comparable results elsewhere because of variations in formulae, other parts of the process, and in product objective.

We all hesitate to disturb a condition which has resulted in one of the most economical distribution or merchandising systems in existence. At present the cost of heavy machinery to the user is set by the manufacturing cost plus only an extremely small direct sales expense and a profit which published figures indicate is seldom more than 8-10%. This situation compares with other distribution procedures which often result in user purchase prices amounting to 50-200% above manufacturing costs. Consumer requests for excessive consulting-engineering service should be tempered by a realization that they are buying equipment having only a very reasonable "mark-up" for profit, sales expense, development, etc. In all probability the question of auxiliaries will eventually stabilize at a point where adjacent devices, attachments, and controls, as well as related electrical equipment, will be offered where their designs do not encroach on confidences made by the user to the supplier, or predetermine the necessary operating technique.

Summary and Conclusions

In conclusion we would like to return briefly to the basic industrial philosophy originally mentioned. Progress must be the joint responsibility of equipment manufacturers and users whose future will depend on adequate liaison and a spirit of genuine cooperation. There will continue to be a defensive resistance by management to radical changes requiring greatly increased capital expenditures and involving unproved theories. The manufacturers must rely on their technicians to define the

(Continued on page 223)

Synthetic Rubbers and Resins as Insulation for Wires and Cables[1]

John T. Blake[2]

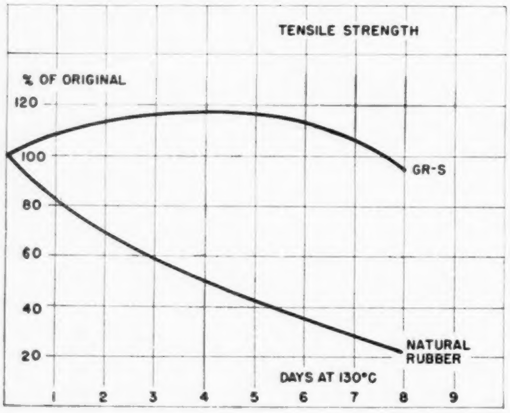


Fig. 1. Effect of Air Oven Aging at 130° C. on Tensile Strength of Natural and GR-S Insulation Compounds

THE past ten years have seen the introduction of synthetic rubbers and resins for use as solid flexible insulations on wires and cables. It is pertinent, therefore, to discuss these newer materials and to compare their properties with those of natural rubber.

Up to ten years ago natural rubber compounds were the only practical insulation of this type. Much progress had been made in the quality of rubber insulation, but the only new basic change was the invention of deproteinized rubber for low water absorption. The other improvements were through new filler combinations, vulcanization techniques, and the development of powerful antioxidants. In many respects, natural rubber insulation has reached maturity, and only minor improvements can be expected in the future.

In contrast to this state of affairs, the field of synthetic materials is in its infancy. We need no longer accept the properties and limitations of a natural product. Synthetics are being developed to have more nearly the properties we want, and the future has unlimited possibilities.

We already have insulations made from the GR-S type of synthetic rubber, and its numerous modifications, from Butyl rubber, neoprene, polyvinyl chloride, Silicone rubber, polyethylene, and Teflon. There will soon be many improvements in these as well as new products to add to the list. Of course these new insulations are not equally important, but the manufacturer and the consumer have a much wider choice of physical and electrical properties to meet a particular set of service conditions.

In considering these new materials and their properties, it is well to keep in mind the features which are of real importance in terms of satisfactory service. The user desires an insulation which is tough enough to be installed without damage and which will withstand the mechanical hazards of its use. He requires suitable electrical properties. Of most importance, these qualities should be stable with time so that the insulation will give good service for a long period. This means resistance to oxidation, heat, light, ozone, water, and any other hazards to which the insulation may be exposed.

[1] Presented at Midwest Power Conference, Chicago, Ill., Apr. 8, 1948.
[2] Simplex Wire & Cable Co., Cambridge, Mass.

GR-S Synthetic Rubber

It is well known that the war forced the development of synthetic rubber, and that this development was a rapid one. Practically all rubber insulations were made from synthetic rubber after 1943. Both the manufacturer and the consumer were faced with new standards. Since they were different, some apprehension was felt that inferior products were being used. It has turned out that insulations made from GR-S, the general-purpose synthetic rubber, have not only been satisfactory, but actually more desirable in many respects than those made from natural rubber.

GR-S is not a single material, since government plants have produced well over 400 commercial varieties. These various types are not equally well adapted for wire insulation; therefore careful selection must be made. GR-S insulation is desirable if the proper varieties are used, even though natural rubber is available today in unlimited quantities. There is every indication that there will be further progress in the development of new polymers. Many of these will be adapted for use in wire insulation, and such products will be even better than those available now.

GR-S wire insulation has tensile strength values which are lower than those of natural rubber. Tensile strength is, however, unimportant in itself. Its principal use is as a means for measuring stability during aging, and this is ordinarily determined through the use of accelerated aging tests. Of course we have had only about five years' experience with the natural aging of GR-S. On the other hand, the wire industry has had more than 25 years' experience with accelerated aging tests and has learned to appraise rubber insulations with a good degree of confidence.

Properly compounded GR-S wire insulations age excellently. As in illustration, typical super-aging natural rubber and GR-S insulating compounds have been exposed in the air oven at 130° C., and changes in tensile strength observed. It is evident from Figure 1 that this drastic treatment has almost destroyed the tensile of the natural rubber compound; whereas that of the GR-S compound is practically unimpaired. Although the actual initial values for the GR-S compounds are somewhat lower than those of natural rubber, they are adequate for any service.

Elongation values in this same aging test for these compounds are shown in Figure 2, and this property of the GR-S compound seems harmed but little. Values for elongation are initially about the same for the two materials, and the stability of this property of GR-S insulation is greater. The indication is that such a GR-S compound would have a much longer life in service where heat and oxidation are the deteriorating influences.

Compression resistance is one measure of toughness. Initial values for GR-S compounds are almost the same as those for natural rubber, although at elevated temperatures they are somewhat inferior. In Figure 3 the behaviors of this property in this accelerated aging test

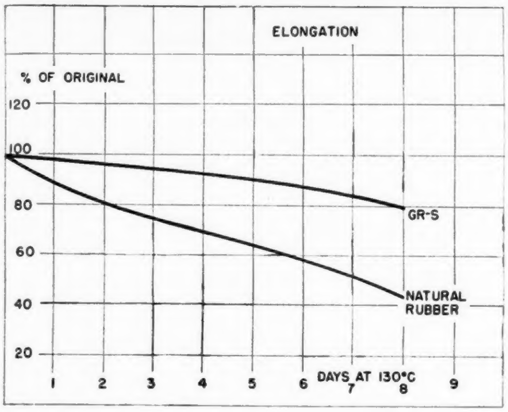


Fig. 2. Effect of Air Oven Aging at 130° C. on Elongation of Natural and GR-S Insulation Compounds

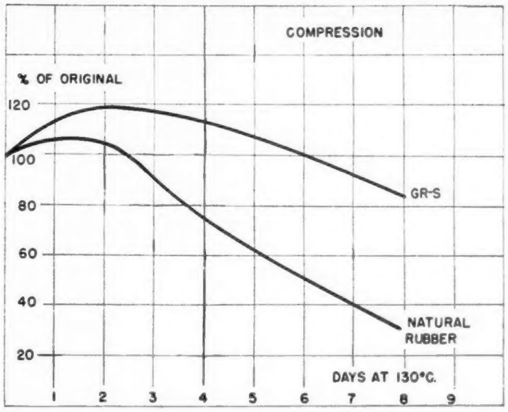


Fig. 3. Effect of Air Oven Aging at 130° C. on Compression of Natural and GR-S Insulation Compounds

are plotted, and it is evident that the GR-S compound is much more stable with age.

Much effort has been directed at improving the resistance of rubber insulation to atmospheric weathering and suncracking. Some progress has been made, but the best natural rubber compounds are still susceptible to this service hazard. On the other hand, properly compounded GR-S compounds are greatly superior in this respect. In Table 1 outdoor exposure tests on mechanically stressed insulation indicate that the time of exposure to failure is very much greater for a wide variety of types of GR-S compounds. None of them shows signs of failure after many times the length of exposure necessary to harm natural rubber insulation.

Table 1. Days of Weather Exposure to Cause Cracking

	Natural Rubber	GR-S
Type I	102	540+
Type II	81	300+
Type III	26	700+
Type IV	28	750+
Type V	63	600+

In the so-called oil-base ozone-resisting compounds, GR-S behaves similarly to natural rubber, and there is no great choice where this property is concerned.

Where insulation is to be used under water or underground where water is inevitably present, mechanical water absorption and electrical water absorption properties are important. The good varieties of GR-S have a lower mechanical water absorption than the best types of natural rubber with the exception of deproteinized rubber. These low mechanical water absorption values in the proper type of GR-S compound give good electrical stability during such exposure, and the insulations are very satisfactory for most services.

Oxidation of rubber during aging increases its water absorption. If rubber insulation is used in shallow water, underground, or where there is alternate wetting and drying, the oxidation that occurs increases deterioration through water absorption. The greater resistance of GR-S to oxidation means that after a moderate period of time the best GR-S compounds may show less deterioration under such conditions than those made from any variety of natural rubber. In deep water where oxidation is not a factor, properly compounded deproteinized rubber insulation is still superior to any present type of GR-S insulation.

Butyl Rubber

Butyl rubber has proved to be superior to natural rubber for inner tubes because of its great resistance to the diffusion of gases. Unfortunately this property is of no virtue in wire insulation, but Butyl rubber has other inherent properties that should be of value. Butyl rubber has low chemical unsaturation which should make it resistant to oxidation, acids, alkalies, etc. Since it is the unsaturation in rubber that is the source of attack by ozone, Butyl rubber compounds offer a chance of high ozone resistance. Unfortunately Butyl rubber tends to give mushy compounds which have low dielectric strength. These deficiencies must be overcome for its successful use in insulation. The problem of proper compounding to maintain the virtues of Butyl rubber and overcome its defects is a nice one. Some progress has been made in this direction, and as we learn more about compounding Butyl, we may develop excellent ozone resisting compounds for high voltage applications.

Neoprene

The electrical properties of neoprene are not good. Its dielectric constant and power factor are high, and its dielectric resistance and dielectric strength are low. On the other hand, it has the advantage of flame resistance and oil resistance, and it stands weathering and sunlight excellently. For low voltage installations it is proving valuable where the somewhat higher cost is warranted for the sake of its good properties.

Silicone Rubber

Silicone rubber is a fairly new development. It is a material with silicon atoms in the structure so that it may be considered to be partially organic and partially inorganic. Like organic rubbers, it may be vulcanized to give an elastic material, although its physical properties are relatively poor. It is susceptible to water, and its electrical properties are only fair. It does stand more heat than is considered safe for rubber and probably can be operated at temperatures as high as 150° C. Thus it is adapted for insulation for special purposes where resistance to heat is needed and its higher cost can be justified.

Polyvinyl Chloride

Butyl rubber, GR-S, neoprene, and Silicone rubber are vulcanizable materials. The process of vulcanization converts them into elastic substances which are relatively unaffected by temperature changes. Polyvinyl chloride is a thermoplastic material; this statement means that polyvinyl chloride has relatively little elasticity, and as the temperature is increased, it becomes gradually softer and softer. Being softened by high temperatures, it can be

extruded on to wire which completes the fabricating operation.

Polyvinyl chloride and its copolymers are made into useful materials for wire insulation by the use of plasticizers. These are usually liquids which are compatible with the hard brittle resin and which convert it to a material that is flexible at room temperature. Most of these plasticizers are volatile to some extent; this statement means that after a long period of heating the plasticizers will evaporate from the insulation to leave the hard brittle resin behind. In addition, these plasticizers may diffuse and thereby change the properties of adjacent materials. Some plasticizers have been developed which are non-volatile and non-diffusible, but the physical and electrical properties that they impart to the finished products are somewhat inferior.

As manufactured commercially, the polyvinyl chloride insulations have good flame and oil resistance, although there is some tendency for certain organic solvents to extract the plasticizer. These insulations may have brittle points as low as about —50° C. and still be fairly hard at 80° C. Being thermoplastic materials, they are somewhat sensitive to sudden blows. Their shattering temperatures are much higher than their bend-brittle points, which fact means that they must be handled rather carefully in cold weather.

Their power factors vary from 6% to 15%, and their dielectric constants are from 4 to 8. Their dielectric strength is excellent, and the dielectric resistance is satisfactory. The power factor values have restricted these materials mostly to low voltage applications, but if it is recognized that they have their limitations, they are very useful for many services.

Polyethylene

Polyethylene is a polymeric hydrocarbon which is flexible and which is being used as wire insulation. Its electrical properties are superb. Its dielectric constant is only about 2.3, and its power factor at all frequencies is only about 0.03%. Both its AC and DC dielectric strengths are high, and its dielectric resistance is excellent. It is inflammable. Its resistance to water is extraordinary. For many purposes its physical properties are good. Its brittle point is probably lower than —70° C., and it does not shatter at low temperatures. It has high hardness and is tough in moderate thicknesses. During the war and since polyethylene has found extensive use in radar and other high-frequency cables.

Although it is ozone-proof, it is susceptible to corona discharges. This is because its melting point, where it changes from a rather hard solid to a soft plastic material, is about 108° C. The local heating due to corona discharges may thus cause melting and electrical failures.

Polyethylene is being used cautiously as insulation in power cables. Some mistrust exists, however, because of its low melting point. If we could be certain that no corona discharge would ever occur on a power cable insulation, and if the temperature of the insulation never exceeded about 85° C., polyethylene would be used more extensively. Unfortunately power cables may get overloaded and heated. With rubber, varnished cambric, and paper insulations, overheating does shorten the life of a cable, but very seldom results in immediate failure. On the other hand, such overloading of a polyethylene insulated power cable could easily be fatal. Exceeding the melting point of polyethylene would distort the cable to such an extent that at least portions of it would be useless.

Some attempts have been made to vulcanize polyethylene and thereby overcome this rather sharp melting point. So far these attempts have not been satisfactory. If it could be done, we could have greater confidence in the possibility of polyethylene insulation on power cables.

Teflon

Du Pont has invented polytetrafluorethylene. Structurally it is similar to polyethylene, except that all the hydrogen atoms have been replaced with fluorine. If we were to enumerate all the electrical and physical properties that the perfect dielectric should have, Teflon would be the answer. Its electrical properties are as good as those of polyethylene. In addition, it is flameproof. It resists all solvents; its physical properties are excellent, and it could probably be operated satisfactorily at a temperature of 250° C. As a dielectric it is ideal, but there are two disadvantages. Its cost at the present time is high. Of more importance, its high melting point makes it practically impossible to process, at least with our present knowledge and equipment. In order to extrude it on wire, temperatures of about 450° C. must be used, and this is close to its decomposition point. The extrusion, even at such a temperature, is only a few feet per hour. It can be made into tape, and taped insulations have been made and used on wire. This construction has the disadvantage of not having a solid structure, but by this device, the superlative properties of Teflon can be used to some extent.

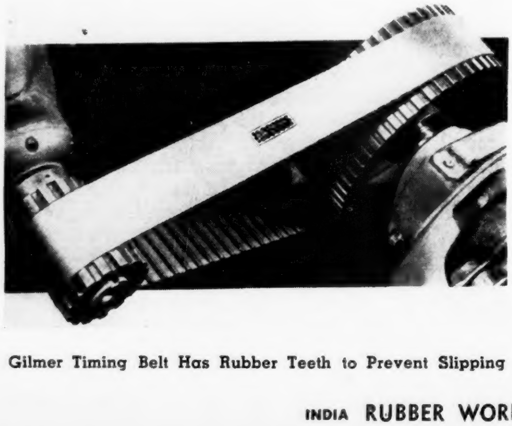
There is some hope that modifications in Teflon will be made so that it can be processed more easily.

Conclusions

None of the synthetics are perfect as insulation, but they each have their place. Using them with proper understanding of their strengths and weaknesses will result in more reliable and longer lived wire and cable insulation. In addition, there are better ones to come.

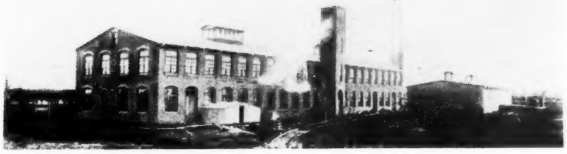
Pulley Belt Designed to Prevent Slipping

A BELT with rubber teeth that will not slip has been announced by the L. H. Gilmer division of United States Rubber Co., Rockefeller Center, New York, N. Y. Said to be enormously strong, highly flexible, and virtually noiseless in operation, the new belt is designed for use on machinery equipped with special pulleys grooved to fit the teeth. Known as the Gilmer Timing Belt, it is reinforced with steel cables embedded in oil-resisting synthetic rubber. The cables reduce stretch almost to zero, eliminating the necessity of take-up devices to remove slack. In operation, the belt makes positive engagement with the pulleys at any speed up to 10,000 feet a minute. The new belt is suitable for use in power transmission and synchronization and will be made in various sizes to meet the requirements of machine designers. Wide usage is expected in the automotive and aviation fields, and on machine tools, business machines, and industrial equipment.



Gilmer Timing Belt Has Rubber Teeth to Prevent Slipping

New Jersey, Rubber Pioneer[1]



The Manhattan Rubber Mfg. Co. Began Its Operations in This Plant at Passaic on January 1, 1894

IN TWO "world" wars the paths of the rubber and the alcohol industries have crossed in New Jersey, and in both instances the results have been devastating to the nation's enemy.

Tradition has it that alcohol, all by itself, made an important contribution to victory way back in Revolutionary days, when the stocks of a small distillery in Lambertville figured in the defeat of the British at Trenton. If historical evidence can be relied upon, the whiskey distilled in that old Jersey town carried the punch of a high-speed, rubber-borne tank destroyer. The story is that British troops failed to take this into account when they tapped a few casks enroute to Trenton, and that this was one reason why General Washington found the opposition in a state of alcoholic disorganization when he descended on them from across the Delaware.

In World War II thousands of applications of alcohol (and petroleum) base rubber to aircraft, trucks, artillery, and warships made important contributions to final victory. Millions of dollars worth of these items made from these miracle rubbers flowed from the production lines of New Jersey's 104 rubber factories.

New Jersey has figured prominently in the mushroom growth of this country's three-billion-dollar rubber goods manufacturing industry. In 1908, with 142 rubber factories inside her borders, the State could claim title as the rubber goods manufacturing center of the world, laurels subsequently lost to Ohio.

Goodyear's Discovery

It was in 1839 that Charles Goodyear's discovery of vulcanization transformed rubber from a novelty into a miraculous new raw material destined to reach into every phase of modern life. And the infant industry was really just getting on its feet when rubber goods manufacturing first made its appearance in New Jersey.

This was in 1848. Two firms, Ford & Co. of New Brunswick, and the Newark Mfg. Co., purchased rights to manufacture rubber boots and shoes under Goodyear patents, and although Onderdonk & Letson, New Brunswick, declined purchase rights, they did pay royalties. With the rush for gold that sent thousands of Easterners to California, rubber manufacturing in New Jersey boomed. Bullion-hungry adventurers clamored for anything and everything made of rubber: ponchos, footwear, rubber coated clothing, hose. Production and profits kept pace with the surging tempo of westward migration.

By 1860 rubber was well established in the industrial pattern of the State, and by reason of improved manufacturing methods and greater know-how the New Jersey industry was able to meet a large portion of the Northern Army's requirements during the Civil War. When the war opened, New Jersey had six well established rubber works: The Lambertville Rubber Co., located on the site of the old distillery; the Mattson Rubber Co. at Lodi; the Meyer Rubber Co. and the New Brunswick Rubber Co. at New Brunswick; the Weldon Roberts Rubber Co. at Newark; and the New Jersey Car Spring & Rubber Co. at Jersey City.

The Mercer Rubber Co. at Hamilton Square is one of the State's oldest mechanical goods manufacturers. It was founded in 1866. The name of Sayen has been identified with the company since the 1880's when it was taken over by Sayen and Austin. Its present president is William H. Sayen, Jr., who, with his brother, F. R. Sayen, has been actively identified with the management since 1905.

Another Newark company that dates to the early post-Civil War period is the Rubberset Co., which was founded in 1873. As the Rubber & Celluloid Products Co., it pioneered extensively in the development of rubber-set brushes of all types, for which it has since come to be so widely known.

New Jersey has in New Brunswick one of the oldest and best known manufacturers of surgical dressings and adhesive tapes in Johnson & Johnson, which celebrated its sixtieth anniversary in 1947. It has been identified with outstanding development in this field since the pioneering discoveries of Lister and Pasteur. The growth of Johnson & Johnson is reflected in the fact that its personnel has risen from less than 50 employes in the early days of the company to more than 4,000 at the present time in the State of New Jersey alone, including the subsidiaries.

The old New Jersey Car Spring & Rubber Co. above mentioned pioneered in a field that made fortunes for many rubber manufacturers in the era of expanding railroad transportation in the wake of the war between the states. Rubber car springs were followed by a multiplicity of rubber mechanical goods for transportation and industry and accounted for a large proportion of the total rubber consumed in this country before 1900.

New Plants

The race for supremacy as the rubber capital of the State was largely between Newark and Trenton; a manufacturers' directory for 1908 credited Newark with 44 rubber companies, Trenton with 39. Trenton now holds a lead in production and tonnage by virtue of the broader scope of manufacturing operations in that city. Many of Trenton's present rubber plants trace their origin back to the period following the Civil War and the industrial growth that ensued to the turn of the century.

The Whitehead Bros. Rubber Co. has occupied the same site as a rubber manufacturing plant since 1870.

Established the same year, and also in Trenton, were the Hamilton Rubber Co., the John A. Roebling's Sons Co., and the Sloane Blabon Corp. They were followed by the Standard Rubber Co., in 1879, founded by W. J. B., Joseph, and Oliver Stokes. Then, in 1893, Frank C. Jones and Arthur Farragut Townsend founded in Passaic what has developed into one of New Jersey's leading plants, the Manhattan Rubber Mfg. Co. (now the Manhattan Rubber Division of Raybestos-Manhattan, Inc.), which traces its origin directly to America's first rubber works, the old Roxbury India Rubber Factory, founded in Massachusetts in 1833.

Roxbury's modern descendants in Passaic still honor the traditions of clever advertising established by the founders of their first ancestor. They like to tell the story of President Andrew Jackson being persuaded to review

[1] This article prepared for India RUBBER WORLD by the public relations department of The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y.

the militia on Boston Common, astride his charger, and shielded against a driving rain by rubber boots, cape, and headgear—made by Roxbury. On the strength of implied presidential approval, it is reported that the next day the fledgling company's shares rocketed in price.

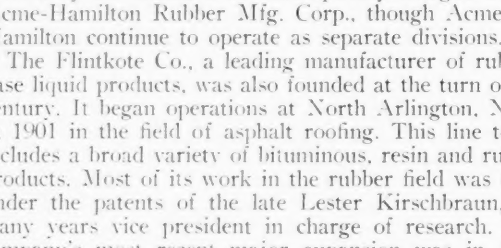
The rubber industry was born in Massachusetts, but the beginning of the present century found New Jersey out ahead. Millions of dollars worth of rubber hose and packing, power and conveyer belting, rubber footwear and coated fabrics, druggists' sundries, dies, springs, brake linings, and countless other mechanical goods for industry and transportation were being produced. The State was the center of the new *hard* rubber industry, a division of rubber manufacturing still paced by such firms as the American Hard Rubber Co. at Butler, and the Luzerne Rubber Co. and until recently the Joseph Stokes Rubber Co. in Trenton. These and other manufacturers of hard rubber products turned out the astronomical total of more than 10,000,000 battery cases and 500,000,000 battery parts during World War II and more than 1,000 other hard rubber products for military use.

The Acme Rubber Mfg. Co. of Trenton traces its origin to the Eureka Rubber Mfg. Co., founded by John Lambert and George R. Cook. Organized in 1902, the company manufactured jar rings, matting, carriage cloth, rubber hose, solid tires for carriages, and at an early date built fabric wrapped automotive tires. Recent management, under Horace Cook, son of the founder, purchased the Hamilton Rubber Mfg. Corp. of Trenton and operated both companies until 1945. The two companies, now owned by A. Kahn, were subsequently merged as the Acme-Hamilton Rubber Mfg. Corp., though Acme and Hamilton continue to operate as separate divisions.

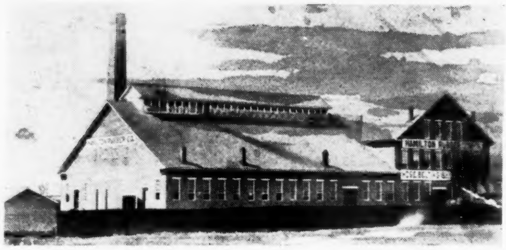
The Flintkote Co., a leading manufacturer of rubber-base liquid products, was also founded at the turn of the century. It began operations at North Arlington, N. J., in 1901 in the field of asphalt roofing. This line today includes a broad variety of bituminous, resin and rubber products. Most of its work in the rubber field was done under the patents of the late Lester Kirschbraun, for many years vice president in charge of research. The company's most recent major expansion was in 1945 when it acquired a factory at Whippany, N. J.

The Manville plant, one of the largest of the Johns-Manville Corp., opened on the banks of the Raritan River in 1912. Developmental leadership (faith in which is now being expressed in construction of a large new Johns-Manville research center across the river) saw this company in the forefront in the use of synthetic rubbers for packings for gas seals and soft lip synthetic rubber oil seals.

The Okonite Co. is headed by an executive whose family name has been identified with most of the history of rubber manufacturing in New Jersey. Its president is Frank Cazenove Jones, son of one of the founders of the company, who founded the old New York Belting & Packing Co. over 100 years ago. The Okonite Co. was established in 1878. A manufacturer of insulated wires, cables, and stripping tapes, this firm was identified with the building of "pipe lines under the ocean" and the "hollow cables" that transported gasoline across the English channel for the invasion of Europe.



Original Building of Whitehead Bros. Rubber Co., Trenton, a Stone Mill Around Which the Present Factory Was Built



The Birthplace of the Hamilton Rubber Mfg. Corp. as It Looked a Generation or Two Ago

In the field of resin, pyroxylin, and rubber coated fabrics and papers, New Jersey has been represented by the Cotan Corp. of Newark since about 1910. It got into the production of rubber coated top decking, sport topping, tire covers, and radiator covers in about 1922.

State Industry at Its Peak

In dollar volume, in production, and in employment, New Jersey's rubber industry is at its peak today. But the State's dominance as the center of manufacturing started to ebb about 40 years ago, when the big tonnage in rubber began to shift to tires and tubes. These are only two of more than 50,000 rubber products, but they now determine where factories are biggest and payrolls highest.

New Jersey factories were building bicycle and carriage tires, however, before Detroit heard the first clash of gear or smelled the first exhaust of a horseless carriage. The New Jersey factories also were well established in mechanical rubber goods at that time. At Manhattan, Thomas Robins, Sr. and Thomas A. Edison were experimenting with a revolutionary way of transporting ores and other heavy materials at low cost, a conveyor belt first used at Ogden, N. J., for electrically concentrating low-grade iron ores.

New Jersey rubber goods manufacturers appear to have been so concerned with their profitable belting and packing business that before they realized what was happening a young but aggressive and rapidly growing industry in Ohio stepped in the back door and skimmed the cream off the fabulous new automotive tire market. When the Garden State people attempted to move in, it was too late. Many tried their hand at it, but between 1910 and 1930 the firms that had gone into (and out of) the tire business were numbered in the hundreds. Automotive tire manufacturing in New Jersey ended during the Thirties, with Michelin the last to go.

Apart from tires, New Jersey's manufacturers have more than kept pace with one of the nation's most rapidly developing and highly competitive industries. More than 40,000 different products flow from the rubber factories of the state, with mechanical rubber goods accounting for the great bulk of the volume.

The swing of the tire industry to the Midwest has diminished, percentagewise, New Jersey's share in the total volume of rubber production, but the continuing growth of rubber enterprise in the State is evidenced by industrial statistics from 1860 to the present.

On the eve of the Civil War, 800 New Jersey rubber

(*Continued on page 223*)

Latex Compounds for Paper Industry

E. G. Partridge[2]

LATEX is a suspension in water of microscopic particles of rubber or rubber-like material. There are two major types of latices, elastic and plastic. Natural and synthetic rubber latices are included in the former, and polyvinyl polymer and copolymer resin latices are among those included in the latter. Solid deposits from elastic latices are rubbery in properties, resilient, can be stretched to a number of times their original length, and, when released, returned rapidly to approximately their original dimensions. Deposits from plastic latices, on the other hand, yield solid materials which, compared with rubber, are harder, much less resilient, can be stretched less, and do not return so well to their original dimensions. Some of this type of latices yield powders when dried, unless especially compounded, and in some cases must be heated to form continuous films.

Natural rubber latex, as it comes from the tree, has a rubber content of about 35-40%, but is concentrated to 60% or more by one of several methods. Concentration by centrifuging or concentration by creaming are two of the best known methods. After bulking and concentration, natural rubber latex is shipped usually in tankers to the United States and other countries. It is then unloaded into storage tanks, from which it is shipped in insulated tank cars to compounders or processors.

Synthetic rubber and plastic latices are made in modern chemical plants where the monomers, in the presence of other necessary chemicals, are polymerized in water and produce latices resembling natural rubber latex. The particle size of natural rubber latex averages about 4/100,000-inch in diameter; while the synthetic rubber and plastic latices have particles even smaller than those of natural rubber latex.

For most uses it is necessary to compound these latices by the addition of other materials to give particular properties. For example, with natural rubber latex it is usually necessary to incorporate sulfur and accelerators in order to vulcanize the rubber, antioxidants to make it age well, and other materials such as colors and softeners to give special properties. These compounding ingredients cannot be added directly to the latex, but must be brought into liquid form in water by dispersing the solid materials or emulsifying the liquids. The particles in these dispersions and emulsions must be reduced to about the same size as the particles in the latices, so that the compounding ingredients will not settle too rapidly. Such dispersions and emulsions are made in several types of equipment, including ball mills and colloid mills.

The various latices require, in general, different types of compounding ingredients and in different amounts. After the proper recipe has been developed for a particular purpose, compounding is effected by mixing the correct amounts of the water dispersed ingredients into the latex.

While the original articles to be made from rubber by the South American Indians, crude raincoats and shoes, were made directly from latex by waterproofing fabric with liquid, the manufacture of products from solid rubber was later developed, and the use of liquid latex was abandoned. In the last quarter-century the manufacture of articles directly from latex has become important. Considerable interest has been aroused, particularly in very recent years, in the use of natural and synthetic latices in paper.

Latex Compounds in Paper

Treatment of paper with latex or latex compounds may be conducted in a number of ways. First, the latex compound may be added to the paper pulp at some stage in the process of making paper, such as in the beater or head box. Addition to the beater has advantages since at this point latex can be uniformly distributed through the pulp without extra processing steps. Difficulties have been encountered with addition to the beater due to excessive foaming, formation of lumps, and accumulation of rubber on the beater and other equipment.

These difficulties are not present to the same extent when synthetic latices are used, and beater application of synthetic latices is being carried out commercially. Addition of synthetic latices at the head box has also been successfully accomplished. There is less tendency to foam by this procedure, but mixing is not so thorough as by addition to the beater. It should be emphasized that important differences have been found between natural and synthetic latices with regard to danger of fouling of equipment when added to pulp, and consideration should be given to addition of properly compounded synthetic latices to the head box in spite of the prejudice existing in many plants against this method, based on earlier sad experiences with natural rubber latex.

Latices are successfully applied to paper by saturation or impregnation of the paper in the wet or dry state. It is necessary, however, to use papers having sufficiently porous structures to allow the latex to penetrate the paper. It is important to select paper of the right properties for a specific use, not only with regard to the properties of the finished paper itself, but also taking into consideration how well a given paper can be saturated with latex and what the properties of the combination are likely to be. The latex compound must also be prepared with the specific properties desired in mind so that for each use it is necessary to select carefully both the proper paper and the proper latex compound in order to obtain the required characteristics in the finished treated paper.

Saturation or impregnation may be carried out in different ways. The paper may be floated on the latex and then immersed, or the latex may be applied to the paper by rolls, spray, or brushes, and the excess removed by squeeze rolls, doctor blade, or air knife.

Latex compounds may be applied to paper by coating either on untreated paper or paper which has been saturated. While the saturation and the coating processes overlap considerably, saturation of paper is used mainly for the purpose of imparting certain physical properties to the paper such as tensile strength, tear resistance, elongation, and wet strength; while coating is used to get surface properties such as grease resistance and attractive appearance as well as resistance to abrasion.

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[1] Presented before Chicago Section, TAPPI, Chicago, Ill., Mar. 23, 1948.
[2] American Anode, Inc., Akron, O.

Evaluation of Compounds for Saturation

In selecting a latex compound for treatment of paper there are a variety of types of latices with widely differing properties from which to choose. While for some purposes certain of these latices may be used without modification, it is often desirable to compound them by adding selected ingredients to impart certain specific properties to the finished paper.

Among the properties often desired for specific uses are increased tensile strength, bursting strength, tear resistance, elongation, wet strength, fold resistance, water, grease or solvent resistance, improved appearance or feel, low moisture vapor transmission, good retention of properties on aging, and increased stiffness or flexibility.

It is difficult to generalize in this matter of the evaluation of different types of latices for paper work since the paper, treating material, and processing all contribute to the finished product. The results of an evaluation conducted in our laboratories of different types of latices as saturants will illustrate, however, the major advantages and disadvantages of some of these materials.

Natural Rubber Latex. Natural rubber latex gives improvement in tear and flexibility and is helpful in combination with synthetic rubber latices to improve these properties. Disadvantages are tackiness and pressure sensitivity which may cause sticking to squeeze rolls. This difficulty may be overcome by the addition of soaps or other surface active materials to the latex. As mentioned previously, the beater application of natural rubber latex involves certain special problems. The tackiness and pressure sensitivity, however, make natural rubber latex particularly useful for some adhesive applications.

GR-S Latex. GR-S latex increases tensile strength and tear resistance somewhat and, with reinforcing materials, will increase further the tensile strength of the paper, but at the expense of tear resistance and flexibility. As is the case with other latices, the percentage of improvement gained is greater the smaller the original strength of the paper being treated.

Hycar Latex. Hycar OR-25 latex gives high elongation and flexibility along with an increase in the tensile strength and tear resistance of the paper. If plasticizers are used, still higher tear resistance and elongation and even better flexibility can be obtained. Paper has somewhat less tendency to stiffen when saturated with this material as compared with GR-S or neoprene latices.

The saturating properties of this Hycar latex are particularly good owing, at least in part, to its small particle size. The latex is especially responsive to compounding so that properties of the treated papers can be altered considerably as desired. Good chemical and grease resistant properties are imparted to the paper by Hycar OR-25 latex.

A recently developed latex, Hycar PA, has particularly good heat resistant properties and excellent light stability and promises to be very useful for treating papers where these properties are of major importance.

Neoprene Latex. Neoprene 700 latex gives high tensile, good tear resistance, and good Mullen value (bursting strength). Papers treated with this latex have somewhat lower flexibility and elongation as compared with those treated with GR-S or Hycar.

A neoprene latex has recently been developed in which the particles, unlike most other latices, are positively charged. This type of latex should have advantages for paper saturating, particularly with regard to addition to pulp.

Evaluation of Compounds for Coating

Since, in general, it is desirable to have saturated papers flexible, plastic latices are not usually used as saturants. In special uses requiring stiffened papers, however, plastic latices may be useful.

The rubber latices described previously as saturants may be used as coating materials. For such use it is often desirable to compound to obtain higher viscosity compositions suitable for spreading operations.

The plastic latices, which are not so useful for saturation or impregnation, are particularly suited for coating applications. These latices give rather hard, but flexible, tough, glossy films, resistant to many chemicals, grease, moisture, and abrasion. When papers are coated with plastic latices, these properties are imparted to the surface of the paper and, in addition, may be modified by incorporation of compounding ingredients. In the same manner as with saturated papers, however, the final properties of coated paper are influenced by the base latex, the compounding ingredients added, the paper itself, and the method of application and heat treatment, so that comparisons of the various latices, as such, for paper treatment are not entirely accurate. Some idea of the properties that may be obtained with the different plastic latices may be gained from the information given below which is based on laboratory evaluation.

Saran Latex. Saran latex imparts good resistance to moisture vapor transmission and requires only a small amount of plasticizer to provide good flexibility with good resistance to most chemicals. The latex of this type with which we have worked has been less stable chemically than the Geons and showed a tendency to coagulate in a relatively short time. Saran latex will corrode steel, and papers coated with it darken on exposure to light. Saran coated paper can be heat sealed at a relatively low temperature.

Geon 11X Latex. This Geon latex has good all around properties. It requires considerable plasticizer to produce a flexible paper, and the coating must be heat treated to produce its maximum properties. A tendency toward surface tack can be overcome by suitable compounding. The latex is quite stable in glass or wood containers, but is somewhat corrosive to steel, though less so than Saran.

Geon 31X Latex. Geon 31X latex gives a coating that is flexible without the use of a plasticizer. It is easy to process and provides films that have outstanding resistance to grease and the transmission of moisture and that develop maximum properties at room temperature. Heat sealing properties are good.

Geon Polyblend Latices. Geon Polyblend latices give films that have the properties of Geon resins plasticized with Hycar synthetic rubber, which acts as a non-extractable plasticizer. By varying the composition of the Polyblend, a range of properties from plastic to elastic latices can be achieved. Properties including moisture vapor transmission and resistance to ultraviolet light are intermediate between Geon and Hycar.

Polyvinyl Butyral Dispersion. This material gives excellent all around properties and is particularly good for the color and transparency of the film retained on exposure to ultra-violet light. The main disadvantage is high cost.

Effect of Compounding Ingredients

It is evident that in order to obtain the best results in the treatment of paper with latices, it is necessary to select carefully both the paper to be used and the type of latex to give the desired properties for any specific final

product, whether saturation or coating is to be employed as the method of application. Since the properties of the latex may be altered by compounding, it is also important to compound with the proper ingredients in the best proportions to obtain satisfactory results both in processing and in the finished paper. The general effect of certain compounding ingredients, however, may be mentioned. It should also be mentioned that there are certain patents in the field of latex compounding that should be taken into account in development work of this sort.

The addition of plasticizers to most latices usually increases tear resistance, elongation, and flexibility while decreasing tensile strength and chemical resistance.

Reinforcing agents, such as some resin emulsions, increase tensile strength and stiffness and usually decrease tear resistance and elongation.

Age resisters are not alike in their effect and also differ in their action on treated paper as compared with latex films. The age resisters have a marked influence on physical properties of treated papers on aging and also on the change in color on aging, particularly in light.

For most uses of latices with paper it is necessary to add stabilizers to prevent coagulation or formation of lumps.

In addition to the above-mentioned materials, it is often necessary or desirable to add other substances such as wetting agents, colors, vulcanizing ingredients, and tackifiers.

Commercial Applications

Some of the commercial applications of latices in the paper industry are as follows:

(1) Paper drapes, table cloths, towels.
(2) Masking tape, pressure-sensitive adhesives.
(3) Paper tape and twine.
(4) Decorative coatings.
(5) Service papers for resistance to grease, solvents, and moisture.
(6) Coatings for temporary protection that may be removed by stripping.
(7) Abrasion resistant finishes.
(8) Artificial leather.
(9) Heat sealable coatings.
(10) Waterproof adhesives.
(11) Coating binder for wall paper, matrix board.
(12) Gaskets of various types.
(13) Floc and *papier mâché*.
(14) Anti-slip paper rug backing.
(15) Paper backed foils.

Unsolved Problems

There are still many unsolved problems in the field of treatment of paper with latices. These problems include the discoloration and change of properties of treated papers on aging, especially in sunlight; insufficient stability of many latex compounds; the difficulty of saturating relatively hard finished papers; and the desirability of wider temperature ranges in which the properties of treated papers are useful. Continuing development work should provide the answers to many of these problems in the near future.

The author wishes to acknowledge the assistance of K. M. Romick, A. F. Spoehr, and R. T. Henson, all of American Anode, Inc., in the preparation of this paper.

New Jersey

(Continued from page 220)

workers were turning out products annually valued at $1,300,000. This represented 22.8% of the total value of rubber goods produced in the United States.

Forty years later the State's relative position in terms of total U. S. production had changed but little. In 1900, 3,700 workers produced goods valued at $11,200,000, equal to 21.2% of the total U. S. output.

By 1940 the value of the State's rubber industry was $48,700,000, the product of 11,800 workers, but this represented only 5.4% of the national total. The tremendous growth of the industry during the war years is reflected in current production, now topping $100,000,000 a year, with employment at an all-time high of more than 20,000.

Rubber goods manufacturers hold the belief that New Jersey is going to do pretty well for a long time to come, even without the tire business.

Rubber and Plastics Machinery

(Continued from page 215)

objective of each problem and contribute practical process experience to its solution. On the other hand, the user is justified in expecting an understanding of his problems from the manufacturer, a willingness to pioneer, and an ability to contribute on the basis of analogous experiences. The product of such a relation must be a thoroughly analyzed "calculated risk" which can be conscientiously recommended and "sold" to the management.

Correction

A typographical error appeared on page 616 of the February, 1948, issue of India Rubber World in the second sentence at the top of the page, left column. This error was in the article entitled, "Effect of Storage and Temperature on Flexibility of Natural and Synthetic Rubbers," by Gregory, Pockel, and Stiff, and the correct sentence is as follows: "Owing to the poor hot tear and hence poor molding characteristics of GR-S compounds as compared to those made from GR-I, the latter is considered to be the most satisfactory synthetic elastomer available for faceblank manufacture at present."

"Rubber Developments." Issued by the British Rubber Development Board, Market Bldgs., Mark Lane, London E.C.3, England. Vol. 1, No. 2, December, 1947 (34 pages), and Vol. 1, No. 3, March, 1948 (30 pages). The December issue contains articles on "Latex Purification and Concentration by Electro Decantation" by H. P. Stevens, "Rubber Seed Oil" by G. Martin, "Latex Processes and Potentialities: II. Molding and Casting" by W. H. Stevens, "Rubber Derivatives" by T. R. Dawson, and "Rubber in Paints" by S. C. Stokes. The March issue contains articles on "Rubber Suspension Systems for Vehicles" by A. E. Moulton, "Farm Tractor Tires" by H. J. Hamblin, "Latex Processes and Potentialities. III. Cement-Latex Composition" by W. H. Stevens, and "Rubber in Architecture and Building" by R. G. Newton.

EDITORIALS

Rubber — Natural and Synthetic. What about the Future of Each?

EVENTS in the rubber industry, and by this is meant both the producing and consuming branches, have progressed to the point where the editor of India RUBBER WORLD feels that he should direct certain comments to the producers of both natural and synthetic rubbers and particularly to the former. These comments are made with the hope that they will prove to be of value to the producers of both natural and synthetic rubbers and to the consumers of both rubbers during the period of the next three to five years.

The events or factors that should be considered by the rubber industry as a whole at this time are as follows: (1) The major consuming country, the United States of America, has defined its national policy with regard to rubber until 1950 to include the production and consumption of at least 222,000 long tons a year of general- and special-purpose synthetic rubbers. (2) Developments in the international situation have resulted in a decision by the U. S. A. to support with several billions of dollars the economic recovery of Western Europe, and with a military rearmament program, the political recovery of this and certain other areas of the world. The demand for rubber and rubber products will therefore continue high. (3) The new synthetic rubbers, such as low temperature GR-S, show promise of being more of a competitor for first-grade natural rubbers than standard GR-S ever did. (4) The differential in price between first and lower grades of natural rubber has widened to a point never before reached in the history of the industry. (5) There is evidence that research and development on synthetic rubber will continue at an accelerated pace both under government and private auspices in the U. S. A.

To producers of synthetic rubber (the U. S. Government is to remain the largest producer for at least a year although plant operation is by private companies) these events mean that production, consumption, and development work on synthetic rubber is guaranteed for more than two years. In view of the present and probable continuing demand in excess of the mandatory production-consumption requirements of 222,000 long tons a year under the Rubber Act of 1948, and the possibility of private producers entering the field in a year or so, the outlook for synthetic rubber for the next three to five years is good.

To producers of natural rubber these events mean the loss of a market for 222,000 long tons of natural rubber a year for two or more years; in fact the loss at the present time is about 350,000 long tons a year because of preference for synthetic rubber in the U. S. A. This additional voluntary consumption may continue unless producers of natural rubber can make improvements both price-wise and quality-wise for their better grades of rubber. The price differential between the higher and the lower grades of natural rubber means that many consumers prefer GR-S at an equal or even higher price than that for the lower grades of natural rubber because of the greater uniformity and possibly easier availability of the GR-S.

Producers of natural rubber should not overlook the fact that although the European Recovery Program and the military preparedness program may maintain the demand for natural rubber at a greater than normal level for the next two or three years, this demand may drop to a level less than prewar when and if these factors are removed and unless natural rubber prepares itself to meet the competition of the synthetic rubber of the future. Continuing research on synthetic rubber in the U. S. A. requires that research on natural rubber must be expanded, better organized, and more practical in its aims, or the demand for natural rubber three to five years from now may be a disappointment to the producers.

Lockwood's April 15 *Rubber Report* suggests the formation of a subcommittee of the already formed Rubber Study Group Development Committee, composed of leading technical men from both the natural rubber producing and the consuming companies. This subcommittee would afford an opportunity for these technical men to discuss and agree on new and improved methods of preparation which would materially aid the processor on the consuming side and furnish a new or specialized market for the large-scale producer.

Another suggestion along these lines made recently to the editor of India RUBBER WORLD is that the natural rubber producers establish a technical service laboratory in Akron, O., or elsewhere in the U. S. A., so that the practical problem of keeping customers satisfied may be more efficiently handled. Technical service to consumers of synthetic rubber has become an established fact, and this service cannot be neglected much longer for the consumers of natural rubber. Already, producers of natural rubber latex are formulating specifications for this special type of natural rubber which are more technical than any specifications as yet proposed for bulk natural rubber, and this is a noteworthy estimation of the trend in the demand for quality and uniformity in natural rubber.

What if the large producers of natural rubber do not decide to undertake a program of research, development, and technical service that will be on a larger scale than anything attempted heretofore? Bulk natural rubber of the prewar grades will still have a considerable demand and for some time at a price several cents above the price for synthetic rubber, *but* eventually it will find that it is occupying a position of second-rate importance and that even special grades which may be produced, if priced too high above comparable grades of synthetic rubber, will not have a ready market.

Plastics Technology

Stretch Orientation of Polystyrene and Its Interesting Results[1]

James Bailey[2]

ORIENTATION, as the term is used herein, means that the molecules have been displaced from a completely random distribution into some more orderly arrangement. As a consequence, the oriented material exhibits anisotropic properties. Early experiments showed that average bulk properties remained relatively unchanged, but that unidirectional properties, particularly tensile strength and optical birefringence, were profoundly modified; while some other properties experienced insignificant changes. The results of these experiments are given in Table 1.

TABLE 1. EFFECT OF ORIENTATION ON PROPERTIES

Properties Substantially Unchanged:

(1) Coefficient of volume expansion.
(2) Transition temperature as measured by the volume expansion method.[3]
(3) Velocity of sound in the ultrasonic region.
(4) Specific gravity.

Properties Changed:

(1) Tensile strength increased 100-200% in direction of stretch in large pieces; up to 500% in small fibers.
(2) Ultimate elongation during testing increased from 2-15% in medium-size pieces, 25-60% in small specimens, and up to 85% in very small fibers.
(3) Crazing strength increased 300-400%.
(4) Tensile strength reduced to one-third the original strength at right angles to the stretch direction.
(5) Birefringence values up to 1,000 orders per inch easily obtained.
(6) Stretching both longitudinally and laterally, as in Polyflex,[4] so as to increase the area by 800% reduced brittleness and increased toughness in polystyrene sheets to such an extent that their properties resembled those of sheet shocks made from the naturally tougher resins.

Many factors are involved in the careful determination of strength, such as temperature, rate of stressing, and shape of test piece. Polystyrene is also a very notch-sensitive material; therefore care must be taken to prevent accidental injury to the surfaces of the test pieces. In addition, the degree of orientation is not necessarily a sole function of the amount of hot stretching since relaxation may also be simultaneously taking place.

For these reasons it would be helpful if some independent means of measuring the amount of orientation produced in the test piece were available, and if some means of following the internal changes in the specimen during testing could be found. Fortunately optical birefringence, using polarized light and a Babinet compensator, provides such a tool. The setup and use of this instrument is essentially the same as that used in the determination of stress by the photoelastic method, but its interpretation is not strictly analagous in the case of hot orientation. However it does provide a useful means of comparing the orientation in different specimens before or during testing. Since the Babinet compensator measures only the difference in optical properties in the two directions at right angles to the light path, its reading is proportional to the orientation only when there is no lateral stretch, and its reading is zero when the lateral stretch equals the longitudinal stretch, as is very nearly the case in Plax Polyflex sheet.

Orientation by Stretching in One Direction

The simplest form of orientation is produced by stretching a shape of uniform cross-section in the temperature range where the material is rubbery. This range starts at the transition point (182° F.) and extends to about 350° F. Since the commercial grades of polystyrene vary in hardness, the temperature at which the optimum physical properties will be developed also varies. In general, the range from 205-250° F. will be found best where stretching can be done under slow rates and controlled conditions.

If the rate of stretching is high, the range near 350° F. must be used, and the specimen must be cooled under tension to prevent relaxation. For example, fibers of a few mils diameter may be stretched down from a ⅛-inch diameter orifice with the plastic at 450° F. if a drawing speed of 300 feet a minute or more is used, because the stress increases very rapidly as the diameter reduces, and the small diameter is maintained under high stress during its rapid cooling.

If the relation between stretch orientation, birefringence, and physical properties is to be studied, the test piece must, of course, be completely relaxed and strain-free at the beginning of the stretching in order to establish the zero position.

Figure 1 shows the results of a long series of experiments on sheet stock extruded from Catalin polystyrene molding powder. The sheets varied in thickness over the range of 0.010-0.020-inch. The specimens were punched out by a special die which gave a straight central portion ¼-inch wide and 2¼ inches long, with enlarged clamping sections at the ends. These specimens were heated to 250° F. for several minutes to relieve all strains, then cooled or reheated to the desired temperature, and stretched at constant rate in an air oven. The stretching was done by an apparatus which speeded up the pulling as the length of the specimen increased, so that a uniform rate of stretching in inches per inch was maintained until the desired amount of stretching was obtained. The specimen was then cooled rapidly to room temperature.

Stretching was done at three different temperatures: 100° C. (212°F.), 110° C. (230° F.), and 150° C. (302° F.). The birefringence was measured on each specimen and reduced to orders per inch (each order is approximately 565 millimicrons for white light).

The specimens were stressed by dead loading, using a bucket gradually filled by a low velocity stream of water. This method gave a controlled rate of loading and permitted accurate determination of the stress at any time. The breaking strength was computed from the weight of the bucket plus water at the time of break and the original sectional area of the test piece. The rate of stressing was approximately 380 p.s.i. a minute, and the breaking time 20-30 minutes.

All of these data are plotted in Figure 1, and the following results should be noted:

(1) The annealed or relaxed strength is about 5,000 p.s.i.

(2) The crazing strength of completely unoriented polystyrene is less than 2,000 p.s.i.

(3) No crazing developed up to the breaking strength when the hot stretch was 230% and the birefringence was 540 orders an inch or more.

(4) Very little increase in strength was produced by hot stretching over 300%.

(5) The curves indicate that the maximum possible strength would be around 12,000 p.s.i.

Figure 2 gives the relation between ultimate tensile strength, hot stretching, and birefringence. These test pieces were prepared by stretching sheets extruded from Dow's 665-K27 polystyrene in an atmosphere of steam. The sheets were 18-24 inches long, 6-8 inches wide, and 0.040-inch thick before stretching.

After stretching, the sheets were cooled and inspected in a polariscope for uniformity, and specimens were punched out, one lot lengthwise to the direction of stretching, and the other lot crosswise to the direction of stretching. The birefringence was then measured. Specimens were tested in a Baldwin-Southwark machine using a stressing rate of approximately 6,000 p.s.i. a minute. This series, therefore, represents what might be called a rapid test. Higher strengths than those shown in Figure 1 would be expected, but very little increase was actually found.

The notable result of this series is that it shows that the strength is increased in the direction of orientation, but is decreased in the direction at right angles to it. The completely relaxed strength was 5,400 p.s.i., which was increased to about 11,000 p.s.i., when tested in line with orientation, and reduced to about 1,500, when tested crosswise, giving a ratio increase of 2:1 lengthwise and a reduction of 1:¼ crosswise. Part of this unexpectedly large reduction of strength crosswise is the result of the material's excessive brittleness and notch-sensitiveness which made it very difficult to obtain flaw-free samples.

It can be noted that the birefringence did not correspond to the tensile strength very closely, but is in reasonably close ratio to the hot stretching. We attribute this fact to some kind of relaxation which takes place and affects the strength, but does not affect the optical properties correspondingly.

Figure 3 shows another set of data comparable to Figure 2, except that stretching was done on a production machine equipped with two sets of pinch rolls running at different speeds; the sheet between was heated in an oven at 205° F. and stretched continuously. Under these conditions it was not possible to obtain completely relaxed sheets to determine the exact ratio of stretching, hence strengths are plotted against birefringence. The polystyrene powder used was Monsanto's L2020P11.

The shape of the curve is comparable to Figure 2 in most respects. About 12,000 p.s.i. seems to be the commercial top longitudinal strength produced by stretching under these conditions, with a crosswise strength near 2,000 p.s.i.

Strength of Small Fibers

A series of monofilaments was made by drawing down the slowly extruded rod

[1] Presented before national conference, Society of Plastics Engineers, Inc., Detroit, Mich. Jan. 21, 1948.

[2] Vice president and research director, Plax Corp., Hartford, Conn.

[3] F. E. Wiley, *Ind. Eng. Chem.*, 34, 1052 (1942).

[4] Plax Corp. trade mark for oriented polystyrene sheets.

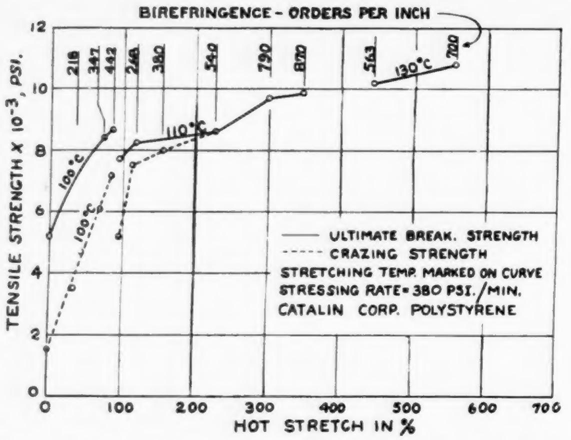


Fig. 1. Relation between Strength, Hot Stretch, and Birefringence in Catalin Polystyrene

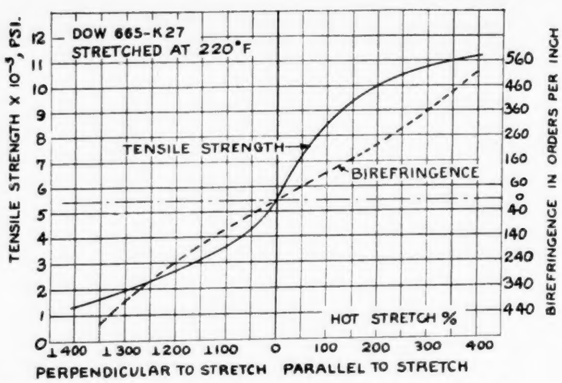


Fig. 2. Relation between Strength, Hot Stretch at 220° F., and Birefringence in Dow Polystyrene

from a 3/16-inch diameter die, heated to approximately 450° F. The rate of extrusion and drawing were controlled so that the shape of the plastic was a cone, the base of which completely filled the die. The take-away speed was between 200 and 400 feet a minute, and the winding drum was about five feet from the die. Care was taken not to injure the fibers, and they were rested for a period of about two days before testing.

Figure 4 gives the results of tests of fibers made from Dow's Q412 polystyrene. It will be noted that under the conditions of manufacture, the fibers had the approximate relaxed strength of 5,400 p.s.i. when the diameter was 0.015-inch. At a diameter of about 0.010-inch the fibers had the 11,000 p.s.i. strength of the carefully prepared and highly oriented specimens in the Figure 2 series which were cut from sheet stock. When the diameter was about 0.0025-inch, the strength had reached 35,000 p.s.i., and the curve indicates that considerably higher strengths could be obtained in the less than 0.001-inch diameter range.

Nearly all plastics, glass, and metals show this increase in strength as the diameter gets very small. It seems to be a universal law of nature and is probably a result of orientation which in these small sizes and exceedingly long stretches eliminates most of the weaknesses and permits the molecules or molecular aggregates to orient themselves into a better stress-carrying position.

Some of the fibers showed cold stretching up to 40%, while others stretched very little. It was found that heat treatment at 200° F., accompanied by a longitudinal contraction of about 10%, gave fibers showing cold elongations up to 85%. The ultimate strength of these fibers was reduced considerably by this treatment. Cold stretchings of 20-40% were generally in the range of 0.005-inch diameter and smaller fibers.

Cold stretching started by a necking down of the specimen, thus forming a rather sharp shoulder. This shoulder then progressed along the specimen until it reached some defect, and rupture occurred. In its manner of formation and behavior the necking down was very similar to that of polyethylene although, of course, very much less apparent.

Orientation by Stretching Both Longitudinally and Laterally

Bilateral orientation occurs in some forms of extrusion, including all cases where tubing is blown up larger than the die and taken away faster than the extrusion speed and in such operations as making Polyflex sheet. The German method causes bilateral stretch by drawing an extruded tube over a U-shaped spreader. All methods which cause the stretching to be done at high temperature result in only minor changes in the physical properties, but polystyrene is by nature so brittle that much longitudinal stretching in such articles as tubing or extruded shapes makes them very prone to cracking longitudinally. Any considerable degree of longitudinal stretch in large, heavy-gage, extruded sheets makes them very difficult to handle or cut to length after manufacture.

If, however, the extrusion is stretched laterally as well as longitudinally, the strength is increased in both of these directions, and the reduced strength lies in a direction straight through the thickness of the sheet where no outside forces can act upon it. Only in the case where the stretch is carried on to the limit in both directions does the sheet exhibit a tendency to break up into laminar layers like mica when sheared or punched.

Bilateral orientation is difficult to visualize. The long molecules do not change the angle of their shadows or projections with either the length or width of the sheet. They simply turn into a position more nearly parallel to the surface, and this angular change is proportional to a function of the change in area of the sheet produced by the stretching. It can be shown that in the absence of relaxation a stretch in each direction of three times (200% increase) will give nearly optimum orientation. In so far as mechanical considerations and production requirements demand that the operation be done at higher than optimum temperatures, there is some practical improvement in carrying the stretch to greater ratios.

In the Plax method the extruded sheet is first run through a series of metal rolls that are held at about 158° F. These rolls cool the sheet rapidly and by friction act as hold-backs to permit tension to be applied to the sheet. The sheet next passes through an oven held at about 255° F., which permits the still hot center to cool down while the chilled surfaces are reheated. The side grippers in the stretching oven take the sheet away at a rate of 2½-3½ times its delivery to the oven so that it undergoes a longitudinal stretch of a corresponding amount before reaching the stretching oven. In the stretching oven it is drawn laterally to about three times its extruded width. The temperature in the stretching oven varies from about 240° F. at the start, 250° F. in the middle, to 175° F. at the exit. After cooling in air, the edges are trimmed, and the sheet is wound on cylinders. The temperatures given above are for average conditions. Hard molding powders necessary for thick, tough sheets require temperatures 10-20° F. higher; while soft powders may run 10° F. lower. The whole machine must be carefully shielded from drafts and well-insulated to preserve uniform temperature conditions.

It has been found that the strength obtainable is related to the thickness of the sheet just as it is in monofilaments. Typical strengths are given in Table 2.

TABLE 2. TYPICAL STRENGTHS OF POLYFLEX SHEETS

Thickness, Inch	Longitudinal Strength, P.S.I.	Lateral Strength, P.S.I.
0.015	7,500-8,000	8,500-9,500
0.010	8,000-9,000	9,000-10,500
0.005	9,000-10,000	10,000-13,000
0.001	9,500-10,500	12,500-17,500

Laminated Polyflex Sheets

If Polyflex sheets are stacked in a laminating press and pressed at 240-2 0° F. with a pressure of 200-300 p.s.i. and then chilled rapidly, very little orientation will be lost, and a remarkably tough sheet is produced. Such sheet is suitable for many applications which require screw fastenings and must carry considerable stress. The impact strength of these sheets is much higher than that of molded polystyrene if the lamination is done at low temperature. In this case the piece absorbs energy by delaminating and bending. If, however, it is tightly laminated, it breaks with a clean fracture and is only about twice as strong as molded sheet.

The ability of laminated Polyflex to carry load is well illustrated by Figure 5, which shows the creep in flexure over a loading time of three years. The long-time strength is well over 5,000 p.s.i., and tests in flexure on the original material gave a strength of 17,800 p.s.i. Some pieces removed after being under 5,000 p.s.i. load for three years gave a strength of 9,400 p.s.i. in spite of the fact that crazing had progressed nearly half-way through the pieces.

Flexural strengths of laminated Polyflex sheet, as commercially supplied, vary from 14,000-18,000 p.s.i. Similar sheets, press polished from extruded sheets, normally give flexural strengths of 7,000-10,000 p.s.i.

Elastic Memory and Unmolding

If a piece of polystyrene is completely relaxed, it will remain dimensionally stable at any temperature unless outside load is

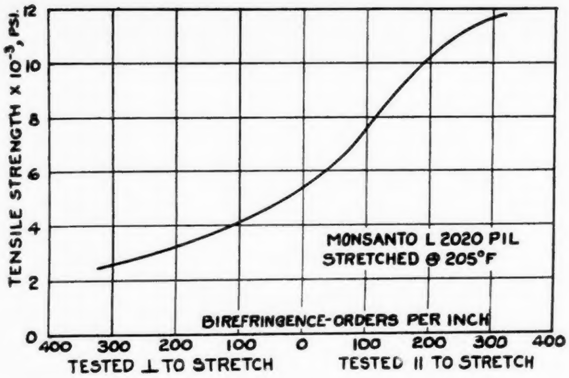
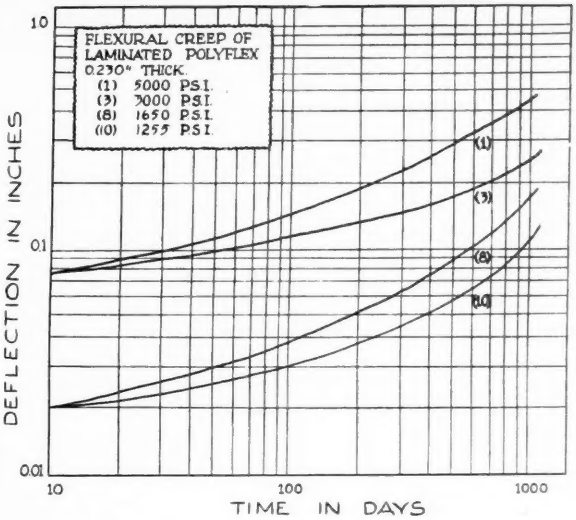


Fig. 3. Relation between Strength and Birefringence in Monsanto Polystyrene



(Right)
Fig. 5. Creep in Flexure of Polyflex Sheet with Various Loadings

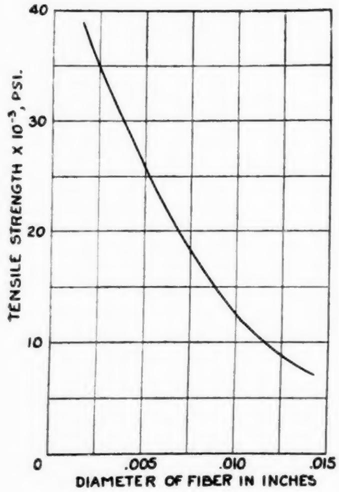


Fig. 4. Relation between Strength and Final Diameter of Stretched Polystyrene Fiber

TABLE 3. RELAXATION RATES OF POLYFLEX SHEETS

Molding Powder	Time in Hours	% Shrinkage at 150° F. Transverse	% Shrinkage at 150° F. Longitudinal	% Shrinkage at 175° F. Transverse	% Shrinkage at 175° F. Longitudinal
Bakelite	50	0.017	0.	0.45	0.25
XMS-10023 ..	100	.045	0.	.60	.54
	300	.090	0.001	.80	.50
	500	.11	.008	.90	.57
Dow 411-A ..	50	0.185	0.015	0.83	0.1
	100	.280	.015	1.01	.1
	300	.350	.015	1.30	.1
	500	.370	.015	1.41	.1
Monsanto	50	0.402	0.017	9.0	0.2
L2020P1	100	.516	.023	11.8	0.2
	300	.70	.050	16.2	1.0
	500	.79	.060	18.4	1.2

applied. If, however, it has been stretched, it tends to resume its relaxed shape and will contract as soon as its temperature is raised to the point where mobility starts. Some of our experiments indicate that the internal forces due to orientation may be equivalent to an external stress of 150 p.s.i. The oriented material therefore behaves like a test piece loaded to 150 p.s.i. and will contract slowly at a temperature considerably below the transition temperature.

The exact temperature at which this long, slow creep commences and the magnitude of the creep both depend primarily upon the "hardness" or softening point of the material. They can be somewhat reduced by slightly relaxing the sheet as a last step in the manufacturing process. This creep is important only in applications where dimensional stability is required in the region above 150° F.

Table 3 shows the rate of relaxation for Polyflex sheets made from one soft and two hard molding powders.

It can be seen that it is important from the user's standpoint that he obtain sheet made from the proper molding powder if he is interested in dimensional stability above 150° F.

Auto Molding

The tendency for Polyflex sheet to unmold may be used to advantage in a process called auto molding. In a typical case, a cylinder eight inches in diameter and 12 inches long was made by this process. Polyflex sheet was wound on a mandrel until the desired wall thickness was secured. The sheet was secured with Scotch tape, and the assembly slipped inside a steel cylinder. The whole was then placed into an oven at 220° F. One end was insulated by a blanket or other shield so that heating progressed slowly from one end toward the other. Under these conditions the heated portion of the sheet shrinks and becomes thicker radially until it forms tight contacts with both the mandrel and the outside cylinder.

The contracting pressure may be as high as 150 p.s.i., as previously stated, so that all air between the sheets is squeezed out and the contracted portion is securely locked in place by friction. As the heated zone progresses along the cylinder, the cooler part of the sheet is drawn into the free space between the mandrel and outside cylinder, and finally a solid, tough, air-free, laminated cylinder is formed. Such cylinders can be made on a wooden mandrel with the outside of the mold made of rolled sheet steel secured against bursting by a strong bolted flange. Close dimensions require machining of the surfaces after baking.

Many objects of large size and enhanced toughness can be made by this method. Its chief advantage is that mold expense is held to a minimum.

Relaxation as a Record of the Manufacturing Process

Because of the elastic memory, it is possible to shrink back oriented polystyrene articles to almost the shape the material had in its molten state. When the stretching is done on a falling temperature cycle, as is very often the case, the specimen will go through the steps of the manufacturing cycle in reverse as it is slowly heated. This process constitutes an amusing and instructive experiment on many molded articles. Plax Polyflex sheet is stretched longitudinally and laterally, with a total area expansion of about nine times. When a square piece of this sheet is slowly heated in ethylene glycol, it shrinks faster in the lateral direction and becomes oblong in shape; as the temperature increases, the oblong gradually changes back into a square.

If the fibers whose strengths are given in Figure 4 are reheated at a series of temperatures, they shrink back to about one-twentieth of their length. This change means that some mechanisms within the material must be capable of operating over stretch ratios of at least 20:1 and is a strong indication that the molecules, especially the longest ones, must be helical or zigzag in shape, and that orientation takes place by stretching the molecules into a longer shape in addition to turning them around into a position more nearly in line with the stress.

It will be found that a 10-inch long piece of the 0.0035-inch fiber shrinks to 1.3 inches in five minutes at 110° C., to 0.75 inch at 130° C., to 0.6-inch at 150° C., and to 0.4-inch at 175° C. A 10-inch long piece of the 0.010-inch diameter fiber shrinks to 3.7, 2, 1.3, and 0.6 inches, respectively, at these temperatures. This condition indicates that the orientation which contributed to strength occurred almost entirely during the temperature interval between 110° C. and room temperature.

Use of the Polariscope

The polariscope has been exhaustively treated in several publications.[5] The most

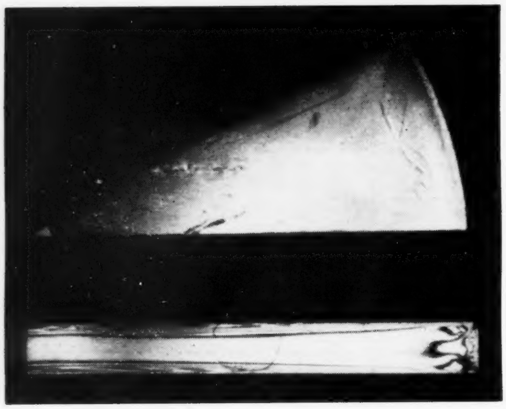


Fig. 6. Top and Sectional Views of Strains Produced in a Disk Made by Pressing a ball of Hot Polystyrene between Parallel Plates

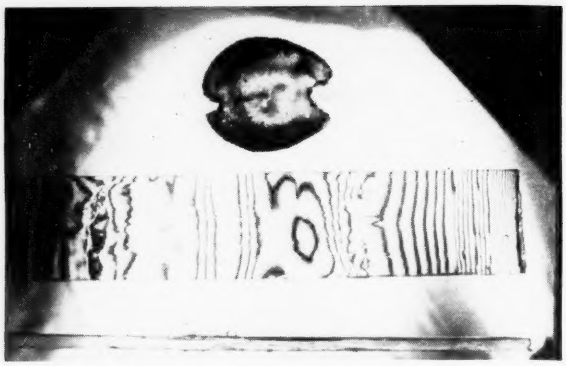


Fig. 7. Top View (*Center*) and Edge Section View (*Bottom*) Showing Strains Produced by Pressing a Cylindrical Polystyrene Extrusion; Section through the Unmolded Portion of the Slab Is Also Shown (*Top*)

convenient type for studying small strains consists of a light source, a Polaroid plate acting as a polarizer, another Polaroid plate set at right angles so as to extinguish the light, and a set of optical wedges. These wedges can be made from stretched polystyrene, as will be described later, or can be purchased in the form of calibrated quartz wedges. For higher orders or more accurate measurements a Babinet compensator is convenient.

A piece of strained or oriented plastic placed between the Polaroid plates gives a pattern of black lines and colors which indicates the strain, its direction, and its degree, but the relation is complicated and often very difficult to interpret. The polariscope indicates only the difference in strain in the two directions at right angles to the optical path. When no strain differences exist a black field is seen; while differences give a series of bright and dark lines composed of prism colors. A uniform strain all over the piece gives a single color, but a varying strain will give a pattern which may be very complicated and require much study to interpret.

If orientation has been done in one direction only, the interpretation is simple since there are no compound stresses. In such cases the birefringence given in orders per inch of thickness follows the stretching rather closely, except at the higher temperatures where relaxation has destroyed part of the stretch. In this latter case the birefringence is a more exact measure of useful orientation than is the ratio of stretch.

When white light is used, only the first five or six bands (orders) are clearly visible. Beyond this range monochromatic light, compensator wedges, order plates, or a Babinet compensator must be used.

The orders observed for the same strain, either hot stretch or stress, are proportional to the thickness of the piece; hence the reading must be divided by the thickness if one specimen is to be compared to another.

If two exactly identical sheets are each stretched the same amount at the same temperature and cooled, they will be found to have the same birefringence. If one of these is placed on top of the other with the directions of stretch coincident, the birefringence will be doubled. If they are placed so that one of them crosses the other at an angle of 90 degrees, they will neutralize one another, and the reading will be zero where the pieces cross, and this portion will appear to have no strain. This point is important because the strains in molded pieces may be very high, but may consist of compression on the outside surface and tension in the interior, and when viewed in the ordinary manner, the piece may appear to be almost strain-free. Such strains can be analyzed by either heating the piece and watching how it unmolds, or by cutting a section and viewing it through the section in a direction parallel to the original surface. Cutting the specimen does not relieve the strains due to hot stretching since these are frozen into the molecular arrangement by elastic memory.

Having this brief description as a background, we may proceed to the study of a few simple cases.

Orientation by Compression Molding

If a ball of hot polystyrene is placed between parallel plates and pressure applied, the ball will be forced into a pancake shape and the material will flow radially outward. Since the radii diverge, the material must also flow laterally, and it is apparent that any element of the material will be subjected to both radial and circumferential stretching as long as the plates move together. This action places the material in bilateral stretch of the same kind as in the Plax Polyflex sheet, except that the stretching is much less and is usually done at a much higher temperature so that the resulting orientation is much less. A study of the mechanics of this pressing operation indicates that no birefringence is caused when the plate is viewed in a polariscope.

In actual practice the ball of plastic would be hot and the plates cold so that the plastic begins to freeze as soon as it touches the metal. Moreover the pressure on the plastic will prevent the plastic from slipping, and the plastic is therefore subjected to shear forces during its progress toward the wall of the mold. The stretch pattern will be frozen in wherever the plastic is chilled during stretching. It is obvious that the flow toward the outside will come from the hottest plastic, which is naturally toward the center. Hence the hottest plastic will always be the part which forms the periphery of the expanding pancake. Eventually this will contact the wall of the mold, and further pressure can cause no motion except a very slight taking up of cooling shrinkage.

Figure 6 shows a sector of a disk pressed in the above manner viewed in the direction of pressing, and a section cut along a radius viewed at right angles to the direction of pressing, both in polarized light. Very little strain is shown when looking through the disk despite the complicated strain pattern shown in the section. The frozen-in strains adjacent to the surfaces are plainly shown. The central part of the disk is nearly strain-free because its flow took place at such a high temperature that it almost completely relaxed after the flow stopped. The complicated strain pattern at the outer edge is due to downward movement of the plunger during shrinkage which set up severe strains in the frozen edge.

If this piece were tested, it would be found to have good strength in all directions, except that it might craze near the edges. It would have good dimensional stability, when heated, because the relaxed interior would tend to prevent shrinkage of the tightly stretched outer surface.

If we had started pressing radially a long cylinder of hot plastic, instead of a ball, the flow would be modified. Radial flow could take place around the ends, but near the center of its length the plastic could flow only in a direction at right angles to the length of the cylinder. This condition constitutes stretch in one direction only and will result in high birefringence when viewed in the direction of pressing.

In actual practice the plastic cannot flow along the contacted surfaces, and the maximum flow must take place at the center. Figure 7 shows an edge section view, a top view, and the section through an unmolded portion of a slab molded from a long, hot extrusion done between platens heated to about 230° F. The birefringence produced was about 500 orders an inch. The unmolded section shows almost complete recovery except along the portion which was roughly half-way between the platens and underwent some relaxation.

This slab was very weak, when bent at right angles to the length of the original cylinder of hot plastic, and very strong in the perpendicular direction, as would be expected from the previous discussion of sheet stretched in one direction only. It also showed a tendency to split in laminar manner when bent crosswise.

An experimental piece was made in the same manner except that the platens were cold, and the pressing was done slowly in a hand-operated press. As the plastic hardened, the pressure was increased until it reached about 2,500 p.s.i. The birefringence was very high, and the unmolded

[5] "Fundamentals of Physical Optics," F. A. Jenkins and H. E. White. McGraw-Hill Book Co., Inc., New York, N. Y. (1937).
"Photoelasticity," N. Alexander. Rhode Island State College, Kingston, R. I. (1941).

portion showed that the plastic had actually been torn in the central portion of the slab. This appeared as a vertical slot in the center of the unmolded section. A section 0.056-inch thick cut across the axis of the original cylinder of plastic was polished and projected in a polariscope, using monochromatic sodium light. The pattern obtained was so complicated that it was very difficult to get a sharp image at 15-diameter magnification. More than 34 orders of strain could be counted in the original negative, which gives 600 visible orders per inch and many more that could not be seen.

Orientation by Extrusion through a Cylindrical Die

According to the laws of viscous flow the plastic in contact with the die wall does not move, and the velocity of flow increases toward the center so that a row of dots placed across the line of flow at one instant would be arranged in a parabola at a later instant of time. The shear is a maximum at the wall and drops to zero at the center. Under conditions of steady flow all the molecules would be arranged parallel to the wall, with those nearest the wall stretched the most. Polariscope studies of actual extrusions indicate that in practice, probably owing to the high temperature, orientation is much less than might be expected. Much of the relaxation or loss of orientation takes place immediately at the exit of the die where the shear forces necessarily fall to zero. The phenomenon of "puffing up" also changes the mild orientation at the center into a more crosswise direction so that rapidly cooled pieces, such as may be made by extruding into water without much stretching between the die and the bath, show medium high longitudinal orientation with small crosswise orientation at the center. Only in cases where chilling is rapid does the orientation from shear in the die have any importance on physical properties.

Orientation within the die does, however, have an important effect upon flow. In the completely random condition the long molecules are distributed irregularly throughout the mass and tend to reduce its mobility. The ordinary measurements on the viscosity of polystyrene show a marked decrease in the apparent viscosity as the pressure through the die is increased. In some experiments which we made on a series of straight, smooth, round viscosity tubes, doubling the pressure drop through the tube caused an increase of from five to eight times the amount of material forced throug the tube. This decrease in the resistance to flow is in our opinion due to orientation of the molecules parallel to the walls, in which position they glide by each other much more easily. The higher the molecular weight and the poorer the flow, the more orientation effects such as the above are present.

One very high molecular weight plastic extruded through a ¼-inch round die three inches long gave peculiar results. Extrusion under approximately 5,000 p.s.i. pressure and at a temperature too low for proper melting gave a material that was fibrous and could be easily picked apart. The fibers lay parallel to the surface and in a longitudinal direction, showing almost perfect orientation. At a higher temperature the fibrous structure disappeared, but shear planes developed so that the central portion of the material slipped through a shell of the plastic and issued from the die at a higher speed than the shell. The shell moved along the die more slowly and the final extrusion appeared to

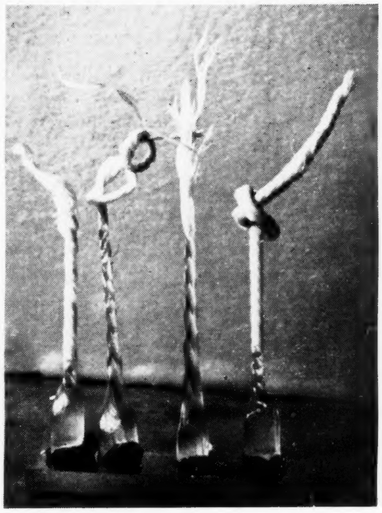


Fig. 8. Rope-Like Structure Developed in Polystyrene by Simultaneous Stretching and Twisting Followed by Lateral Pounding

be a rod surrounded by bell-shaped sections of tubing. In this case the slipping undoubtedly generated local overheating which aided the gliding action. Attempts to melt the tubing-like outer part by using a very hot die gave a zigzag shape. A smooth extrusion was obtained only when the plastic and the die were at the same temperature, the plastic was uniformly melted before entering the die, and the extrusion velocity was held below a certain maximum.

Spider lines are another effect of orientation and are difficult to eliminate in polystyrene extrusions. Often tubing, as it leaves the die, appears to be free from spider lines, but subsequent blowing up to a larger diameter reveals them because the material oriented longitudinally stretches more easily in a lateral direction, as would be expected from Figure 2, and the spider lines blow to a thinner wall.

Surface dullness is also a phenomenon of orientation and occurs as the longitudinally oriented surface leaves the die. The die is stationary, of course, and the plastic is moving. At the very edge of the die the plastic loses the support of the die and is subject to heavy tensile strains. The longitudinally oriented fibers or molecular aggregates have already been strained to the limit by the orienting forces within the die so that they tear in a minute pattern at the die edge. This pattern, because of relaxation is short lived and appears as a matte or dull gloss surface if the extrusion is stiff or rapidly chilled. Viewing such a surface under 50-power magnification, illuminated with incident light, shows that the little surface ruptures have partially disappeared and look like irregular eroded cavities arranged in lines. They are not caused by roughness in the die because the pattern changes along the length of the rod; some lines diminish and disappear; while others form and grow larger. This behavior cannot be seen in the small field of the photomicrograph.

Peculiar Effects Made Possible by Orientation

It has already been shown that longitudinal orientation makes the material very weak crosswise so that the fibers are easily split apart. By combining longitudinal stretching with twisting, orientation in a helix results. The fibers under this arrangement may be split apart, but, if so, are still arranged very much like the fibers in a rope and cannot be separated by tension. Like a rope, however, the whole is flexible and can be wound around objects or tied into knots, as shown in Figure 8.

The four specimens were made by reheating sections of ⅜-inch square polystyrene rod, stretching them to about 10 times their original lengths, and then twisting them by varying amounts; all operations were done at the proper temperature. The twisted rods were held while cooling to prevent relaxation. Part of the twisted portion of each rod was then subjected to mild hammer blows which caused the fibers to crack apart along the lines of weakness. This action changed the hard, rigid rod into a flexible, rope-like material as shown in the illustration. The base of each rod is the original extrusion showing part of the drawn down and twisted portion in its still glass-like condition. The ends of some of the specimens have been forcibly untwisted to show the fibrous nature of the material. The fiberized samples furnish the most vivid demonstration we know of the effects of orientation in polystyrene.

It is evident that the process can be mechanized and that the fibrous structure can be developed by many other methods than controlled pounding. Certain other plastics also respond to the same treatment.

Theoretical Aspects of Orientation

Unilateral Stretching

The polystyrene molecule is from 20-200 times greater in length than in width.[6] In this respect it may be treated as a long cylinder. If it is coiled into a helix, this coiling has the effect of reducing the length to width (or diameter) ratio. If we treat the problem as one of rigid cylinders being moved around into more parallel positions by stretching, as would be the case if we were dealing with a system of stiff fibers in a mixture of stiff molasses, an understanding of the problem becomes simple.

Let us select a cube of the material, the edges of which are the X, Y, and Z coordinate axes of space. We are going to stretch the material in the Z direction, but before doing so we must determine the angles of all the molecules with respect to our space coordinates. To do this work we measure the direction of the axis of one molecule and then draw this direction through the center of a sphere so that the direction is strictly parallel to the molecule we selected. We repeat this procedure for every molecule in the cube. The direction of each molecule would pass through some point in the surface of the sphere. Let us place a small dot at this point. If we now look at the sphere from any direction whatever, the dots will be equally spaced if the original cube of material had a completely random structure, and each unit of area on the sphere will contain the same number of dots.

In Figure 9-A such a sphere is shown. The little unit of area marked on its surface is typical. Since we intend to stretch the material in the direction Z, the angle which any molecule has with the OZ direction is important. All the molecular directions in any zone of height, h, may be considered as a unit, and we shall concentrate them on one radius passing through the half height of this zone. Their number

[6] "Frictional Phenomena," Andrew Gemant, *J. Applied Phys.*, 13, 90, 152, 692 (1942).

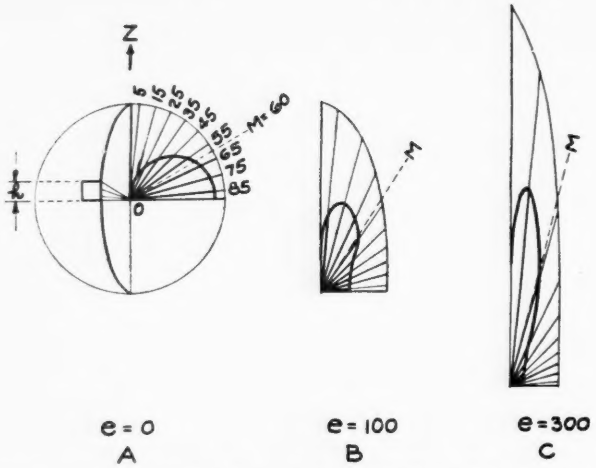


Fig. 9. Changes in the Average Axial Directions of Polystyrene Molecules Upon Stretching in One Direction

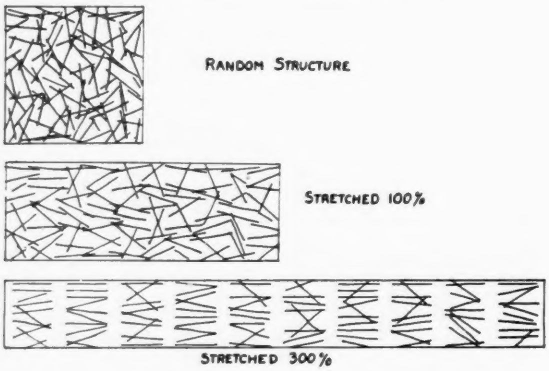


Fig. 10. Representation of Molecular Angular Changes upon Stretching

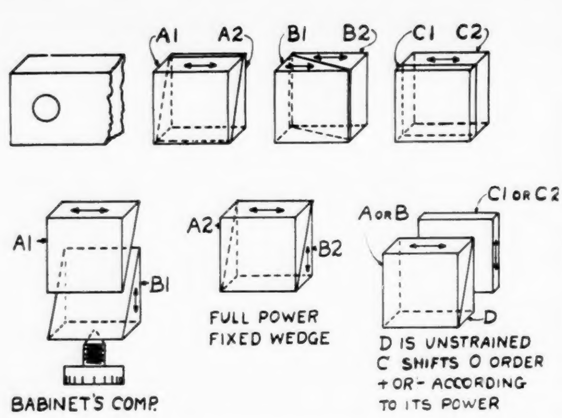


Fig. 11. Methods of Cutting Stretched Polystyrene to Produce Optical Wedges and Order Plates

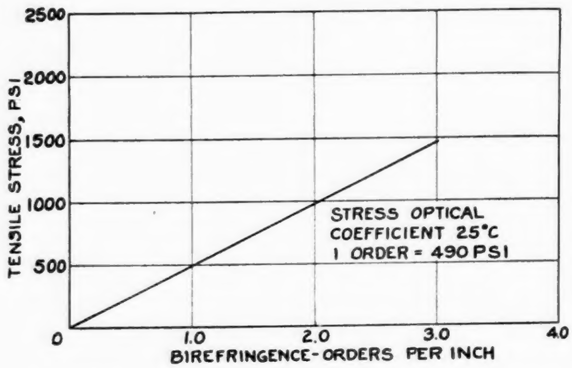


Fig. 13. Stress Optical Coefficient of Polystyrene at 25° C.

is, of course, proportional to the area of the zone. An accurate mathematical solution is involved and difficult,[7] but by dividing the surface in 10-degree angular heights an approximate solution, easily visualized, is obtained. Let us cut out a quarter of the sphere and draw the radii from 5-85-degrees in 10-degree steps. Each of these radii is the center of a 10-degree zone, and the area of the zone is proportional to the number of molecules in that zone. We now lay out arrows on the radii the length of which are proportional to the zone area of the sphere, and the lengths of these arrows represent the number of molecules involved in the 10-degree zones. The direction of the arrow gives the average direction in the zone.

If we stretch the cube and the sphere in the Z direction until they are twice as high (stretch ratio $X = 2$), or $e = 100\%$, it can be shown that the directions of the molecules in the stretched cube will still be parallel to the directions in our stretched sphere, which will look like Figure 9-B. Not so many molecules are at or near right angles to the direction of stretching, and where the average molecular direction was formerly 60-degrees to the OZ line, it is now at 31.5-degrees. If we continue the stretching until the height is three times its original radius ($X = 3$), or $e = 200\%$, the sphere will now look like Figure 9-C, and the average direction of the molecule will have moved to a position only 18.4 degrees from the OZ axis. When the stretch is four times, the angle has dropped to 12.2 degrees. It does not appear that continued stretching will add much to the orientation, and indeed Figures 1, 2, and 3 indicate that this is the case when stretching was done at low temperatures.

A more direct picture of the changes in direction of the molecules that take place upon stretching is shown by Mr. Loring's representation in Figure 10.

We cannot overlook the fact that as the strain increases, the tendency to relax increases, and at higher temperatures, where mobility is greater, the viscous flow and high rate of relaxation will limit the amount of residual orientation which can be left in the cooled piece. In such cases the birefringence is a much better measure of the orientation than is the hot stretch ratio.

In Figure 4, however, we have strengths running up to 35,000 p.s.i. and an unmolding ratio of 20:1. We cannot explain this state of affairs in a satisfactory manner except to say that because of the rapid stretching and the small diameter of these fibers the molecules must have been straightened from a zigzag or helical shape into more elongated shapes, with the result that more of the load is thrown directly on the carbon-to-carbon linkages and less on the weaker Van der Waal's forces.

Bilateral Stretching

A treatment similar to the above will show that when equal stretching is done in two directions at right angles, a projection of the molecules remains unchanged on the face of the piece in the third direction, but its angle with the face is rapidly reduced. For example, let the angle of a molecule in a slab be 60 degrees with the face of the slab. The angle after stretching without any relaxation will be changed as shown in Table 4.

TABLE 4. ANGULAR CHANGE UPON STRETCHING

e	X	Angle A
0	1	60°
100	2	12°+
200	3	3°+
300	4	1.5°+

where: e = % increase in length and in width.
X = ratio between stretched length or width and original length or width, respectively.
A = minimum angle between the axis of the molecule and the face of the plate.

It appears that very little is to be gained by stretching Polyflex more than to nine times its original area, and experience indicates that this condition is true in the thicker gages. However, just as fine fibers seem to develop unexpected strength by long stretching, so also does thin Polyflex sheet. Such thin sheets in gages of 0.0015-inch and under develop strengths up to 17,000 p.s.i. which cannot be obtained in the heavier sheets. These thin gage sheets show cold stretching up to 50%, and figures up to 60% are not uncommon.

Polystyrene Optical Wedges

When fully annealed and relaxed poly-

[7] Our laboratories with the assistance of Samuel J. Loring, consulting engineer, are attacking the problem of working out a correct mathematical solution to the effect of orientation on strength which is hoped may furnish the subject of another paper.

styrene is stretched at a low temperature (210-230° F.), it develops optical birefringence which is nearly proportional to the amount of % elongation. By suitable cutting of such pieces compensator plates and wedges of any desired power can be made. We have made and used such wedges for a number of years. Since the process is simple, it is described there as one of the interesting results of orientation.

A simple apparatus for stretching polystyrene consists of a steam box heated by boiling water, the steam from which rises through a series of holes into the oven. A good piece of polystyrene slab is placed through the oven, and one end secured by a swivel joint. The other end of the slab is similarly secured to a cable. The joints must be carefully centered so that the polystyrene will not bend as it stretches. A load applied either by weights or a windlass is arranged so that it can be applied when the piece is thoroughly and uniformly heated.

For a 1/16-inch thick piece the heating period should be at least five minutes after a thermometer in the box indicates 212° F. A slab ½-inch thick should have a heating period of about 20 minutes. After this, the load is applied until the piece has stretched from 50-100% and is then reduced until no more stretching results. The reduced load is left on during the cooling period, which is best done by blanketing the box, shutting off the heat, and allowing the whole to cool down normally. When the interior temperature has dropped to about 120° F., the piece may be removed from the oven and cooled in air.

Both ends of the piece will be enlarged, but the center length will be of substantially uniform size. This portion may then be cut into the shapes and sizes of wedges shown in Figure 11. The power of the wedge depends on the amount the polystyrene was stretched and on the difference in thickness between the thin side and the thick side of the wedge, as, for example, in A1 and B1 in the illustration. When the two wedges have exactly the same shape, they will neutralize each other along the center, and a black line will be seen at this point when viewed in a polariscope. A series of parallel lines showing spectral colors will appear on either side of this black line. In white light only five to six lines on each side will be clearly visible, but in monochromatic light, as with sodium or filtered mercury vapor lamps, the whole surface will be covered with bands. In general 10 bands on each side are enough, and calibrated order plates, such as C1 or C2, are used to change the order. Low-power wedges are useful on thin pieces, and high-power wedges are useful for rough measurements on thick or highly strained pieces.

Two precautions should be taken when making these wedges. Polystyrene is soft, and its surface easily cold flowed by frictional heat and pressure. Sawing should be done with a sharp saw flooded with water. Grinding should be done with sharp, clean, waterproof sandpaper, also flooded with water. A sharp scraper may be used in "hogging down," but all the lines and roughnesses produced should be ground out. From time to time the power of the wedge and its characteristics can be checked by covering the dried surface with Nujol and a cover glass and viewing it under polarized monochromatic light. The lines should be straight since, if they are wavy or zigzag, the polystyrene is not homogeneous, and a good wedge cannot be made from it. Visible, fine, sharp jumps are probably due to scratches on the surface and must be ground out.

The diagonal surface must be accurately flat so that it can be cemented on to its backing compensator wedge. Thin wedges require a stiff backing plate during grinding and polishing. We have found that stiff glue makes a good temporary bond. When desired, the piece may be pushed off and the glue washed away with water.

Polystyrene is crazed by most solvents. The two wedges, A1 and B1, may be cemented together with ordinary turpentine varnish, or may be clamped together and heat sealed at the corners with a hot iron. Acetone, amyl acetate, and similar solvents must never be used because they will cause clouding of the wedge within a few weeks.

The birefringence put into polystyrene by hot stretching is opposite in sign to that developed by cold stretching. This condition has no significance in the use of the wedges, but it must be born in mind when the wedges are used to analyze strains. Some of the peculiar edge effects in molded and stretched extruded shapes are due to changes in the stress optical coefficient near the transition point.

Figure 13 shows the appearance of a piece of square polystyrene rod bent at 212° F. (in boiling water) and then cooled. Another piece of the same rod was loaded by a strut and placed to the right side of the first piece over the same wedge. The left side (convex) in each piece is the tension side; yet the slope of the lines is opposite in the hot bent and cold bent pieces. Stated otherwise, hot tension shifts the bands in the opposite direction (downward).

The stress optical coefficient for polystyrene at room temperature is shown in Figure 12. It is 490 p.s.i. per order (band) per inch of optical path (thickness). The birefringence-stress curve is a straight line up to about 1,500 p.s.i. stress, after which crazing and cold flow may start. The coefficient, being associated with strain, varies rapidly with temperature as the polystyrene softens.

Fig. 13. Strains Produced in Polystyrene Rod by Hot Stretching *(Left)* and Cold Stretching *(Right)*

Summary and Conclusions

Orientation is the cause of many of the peculiar properties of polystyrene.

It may be advantageous or detrimental, depending on its amount and direction and the article.

Orientation and the associated birefringence enable much useful information on the manufacturing process and the strength of the article itself to be gathered from a study in the polariscope.

The mechanism of orientation is not completely understood, but it is believed that considerable useful information has been gathered.

Very small fibers and very small sheets seem to possess inordinately great strength.

Cold stretching up to 60% in thin sheets and 80% in small fibers may be developed by hot orientation and controlled relaxation, but such pieces do not show maximum strength.

Acknowledgments

The author wishes to acknowledge the helpful assistance of the various members of the Plax laboratories who spent much time in preparing the data which furnish the basis of this paper. Acknowledgment is also made to J. M. DeBell for assistance and helpful criticism, and to Samuel J. Loring for his mathematical analyses which lead to Figures 9 and 10.

Plastic Foam Material

U.S. FLOTOFOAM, a plastic foam insulating material that combines exceptionally low thermal conductivity with very light weight, is produced by United States Rubber Co., New York, N. Y., for low temperature installations. Present applications include commercial and home refrigeration units and shipping containers for fresh and frozen foods, and other practical uses include transportation refrigeration in all types of carriers. The material is also suitable for flotation purposes, for soundproofing, and for display and novelty uses. Its insulating properties are such that walls in installations can be made thinner to increase storage capacity, and the foam is non-corrosive, non-toxic, self-extinguishing, will not support mold or bacteria growth, and holds its insulating value over a wide range of mean temperatures.

The snow-white plastic foam is available in shredded and block forms weighing 0.8-1 and 0.8-1.5 lbs./cu.ft., respectively. Both blocks and slabs can be made in a variety of sizes and shapes to fill cavities and can also be surfaced with paper, cloth, or resin coatings. The shredded form can also be supplied in individual containers ready for installation. Flotofoam is made from a combination of soluble resins processed first into a liquid, then into a froth, jelled, permanently set, and finally dried. The material consists of less than 1% solid and over 99% air. The thermal conductivities of the shredded and block forms over a mean temperature range of 9-100° F. are 0.173-0.208 and 0.20-0.23 BTU/hr/sq.ft./°F./in., respectively.

Fig. 7. Test Pieces Showing Mar Resistance

Samples Showing Mar Resistance: ***Left-Hand Column (Top to Bottom)*** **Dixie Clay, Atomite, Super Floss Gartex, Whiting;** ***Right-Hand (Top to Bottom)*** **Micronex, P-33 Carbon, Silene, Kalvan**

Fig. 8. Whitening Effect Caused by Bending Sample

30 revolutions were required to establish a scratch pattern on the surfaces of the pressed test sheets. Figure 7 shows the marring on the 80-volume stocks. Dixie Clay stocks show only slight marring; Micronex, Silene, P-33, and Kalvan stocks show only very slight marring; and Atomite, Super Floss, Gartex, and whiting stocks show marked marring tendencies.

It is thought that mar resistance is indirectly a function of particle size, since the stocks containing those fillers having the smaller particle sizes show the greatest resistance to marring. This is believed to be caused by the greater adhesion of the smaller particles to the plastic binder, thus preventing the formation of vacuoles in the abraded plastic surface which appear to the eye as a whitening of the surface. This same whitening effect is also observed when the plastic test sheet is bent double (see Figure 8).

Summary and Conclusions

It has been shown that the finer particle-size fillers increase the tensile strength of vinyl plastic stocks. The coarser fillers act as diluents; the higher their volume loadings, the lower the tensile strength obtained.

Mar resistance is a function of particle size; the stocks containing the finer fillers give excellent resistance; while those with the coarser fillers, even in low concentrations, show definite marring.

Grateful acknowledgment is given to L. B. Sebrell and H. J. Osterhof for permission to publish this paper, as well as thanks to H. A. Endres and G. H. Gates for their helpful suggestions and criticism in the preparation of the paper.

SPI Forms Vinyl Film and Sheeting Group

TO CONTINUE to maintain quality standards for products in the plastics field, a representative group of processors of vinyl film and sheeting met recently at the Commodore Hotel, New York, N. Y., to set up a permanent organization. The gathering was sponsored by the Society of the Plastics Industry, Inc., as a cooperative effort on the part of manufacturers in the plastics industry to establish standards of quality for plastic materials used for such products as upholstery, luggage, sporting goods, floor and wall coverings, packaging, shoes, industrial uses, etc. William T. Cruse, SPI executive vice president, acted as interim chairman of this new Processors of Vinyl Film & Sheeting Division. Subdivisions were also set up to handle the six main end-use classifications in this field.

SPI Pacific Coast Conference

The Pacific Coast Section, Society of the Plastics Industry, Inc., held its fifth annual spring conference on March 28 to 31 at the Santa Barbara Biltmore Hotel, Montecito, Calif., with the general theme of "Creative Selling for Good Plastics." H. G. Pratt, American Cyanamid Co., was general chairman of the meeting, which included merchandising, technical, luncheon, and dinner sessions. The first day, March 28, was devoted to registration, while the last day of the meeting, March 31, consisted of a golf tournament at Ojai Valley Country Club, Ojai, under the chairmanship of Elmer Huling, Wilcox Plastics, Inc.

Monday, March 29

R. B. Gutsch, aaRBee Plastic Co., was chairman of the day, which opened with a morning non-technical session at which Neil O. Broderson, Rochester Button Co. and SPI director, gave a "Review of the National Industry," Roy L. Peat, Peat Mfg. Co., discussed "The Western Plastics Industry," and C. J. Romieux, plastics division of American Cyanamid Co., spoke on "How Do We Go from Here?"

Mr. Broderson reviewed the progress of the plastics industry during the past year. The SPI and SPE have found a common ground on which to talk and have resolved some of their differences, he reported. There has been some progress along the line of informative labeling, but this is still an open problem. The SPI educational committee has done an outstanding job in alerting merchandisers of plastics to the necessity of getting the right material and the right properties for each specific application. The SPI accounting manual has been published and found to be of increasing value to both great and small operators in the plastics business.

Mr. Peat discussed the growth of the Pacific Coast plastics industry and emphasized its reliance upon the service given to producers of plastics parts by the raw material and machinery suppliers.

Mr. Romieux said that very great progress has been made during the past year in overcoming the ills of the plastics industry. Withdrawal of many misapplications from the market, increased emphasis on quality control, and informative labeling on the part of the molder have been most helpful in strengthening consumer acceptance of plastic products. The SPI educational program has also done much to strengthen the industry. The question is no longer, "Where do we go from here?", but "How do we go from here?" because further progress depends on how we handle our business, the speaker said. Although much of our business in the past has come to us, we must now seek business through what has been termed "creative selling," he added. This can be accomplished by an agressive program of market analysis and development, studying customers' problems, and translating the physical characteristics of plastics into better parts for their products.

The luncheon session featured a talk on industry cooperation by SPI President George H. Clark, Formica Insulation Co., and a talk on "Informative Labeling" by J. R. Turnbull, Monsanto Chemical Co. Mr. Clark reviewed the progress of discussions between SPI and SPE and complimented the former on its handbook. He also discussed the whole SPI program and its benefits to both industry and consumers.

Mr. Turnbull reviewed progress in informative labeling which has been made to date, although he admitted that misuse of materials still exists. A solution to this problem may come from the booklet on plastics issued by the Plastic Materials Manufacturers Association, which contains a glossary of terms for use by buyers.

J. Fraser Rae, Industrial Plastics Service, presided over the afternoon technical session, which consisted of papers by W. O. Bracken, Hercules Powder Co., Walter E. Rahm, E. I. du Pont de Nemours & Co., Inc., and C. A. Norris, Bakelite Corp.

"Dimensional Stability Tests on Injection-Molded Cellulose Derivatives and Synthetic Plastics" was the title of Mr. Bracken's paper. Mr. Bracken reviewed the extensive research program conducted by Hercules on the behavior of cellulose derivative plastics upon exposure to relatively severe conditions of heat and humidity. The speaker showed many slides of results obtained in comparative tests with other plastics, which indicate that the cellulosics through their versatility, inherent in wide formulation possibilities, can be adapted to meet severe service exposures.

Mr. Rahm spoke on "The Molding of Nylon." A dozen different nylon molding compounds for injection, compression, and extrusion are now in production, either commercially or on a semi-works scale, and nylon can also be solution coated. The speaker described the different nylon compounds and gave detailed information on methods of handling and molding, with particular emphasis on the modifications

from conventional techniques which they require.

Mr. Norris's paper was on "Practical Application of the Theoretical Aspects of the Closed Mold Method of Molding Thermosetting Materials." The closed mold or compression molding method has expanded greatly in recent years because of four factors: (1) the issuing of licenses to operate under patents assigned to the Shaw Insulator Co.; (2) the development of improved methods of preheating, particularly high-frequency methods; (3) wartime demonstration that the method was mechanically practical and economically sound; and (4) the modernization and application of the opposing ram press to compression molding. The speaker discussed the factors and also the five principles which must be observed to give maximum efficiency: mold design, selection of material, molding pressures, mold and preform temperatures, and preform size and pressure chamber dimensions.

An informal dinner session was held in the evening, which featured a panel discussion of "Freight Rates as They Affect Our Industry," by Frank E. Wilcox, Wilcox Plastics, Inc., Alvin E. Hewitt and Larry Osborne, both of California Manufacturers Association, and John A. Worley, B. W. Molded Products Co. The speakers held that the high freight rates on incoming and outgoing shipments were discriminatory against the West Coast area. As a remedy, they proposed the inclusion of freight as an item of cost when West Coast producers bid on jobs.

Tuesday, March 30

The morning session, under the chairmanship of C. L. Wurdeman, Rezolin, Inc., was of a technical nature, and three papers were presented. The first paper, "Synthetic Resins in Rubbers," was given by Leonard C. Boller, U. S. Research & Development Co., and consisted of a general review of the applications of resins in the rubber industry. Mr. Boller discussed the use of phenol formaldehyde resins in blends with nitrile rubbers, the liquid "Thiokol" polymers, the use of vinyl resin-nitrile rubber blends, and the high styrene copolymers. For each type the speaker gave some general information on blending, compounding techniques, results obtained, and uses.

"Polyester Resins" was the title of the second technical paper, presented by E. L. Kropa, American Cyanamid Co. While the term "polyester resin" has been used to describe many of the compounds cured by the loss of unsaturation, "thermosetting vinyl polymers" appears to be a preferable designation. Mr. Kropa described the development of these materials during the war as a backing for fuel cells and discussed their nature from the viewpoints of chemistry and crystallinity in comparison with other resins. He drew an analogy between the polyester resins and rubber, showing that styrene acts as sulfur does in rubber; while peroxides perform a function similar to accelerators in rubber.

The final technical paper of the session, "The Behavior of Some Alkyl Peresters and Hydroperoxides in Some Polyester Resins," was given by Reginald P. Perry and Kenneth P. Seltzer, Union Bay State Chemical Co. Peroxides now manufactured in quantity include three alkyl peroxides and two peresters which are soluble in or miscible with all of the polyester resins. The speaker discussed the individual peresters and hydroperoxides and their use as catalysts for the resins. Despite the promising results they give they will not make obsolete all other existing catalysts, but should be considered as supplements to the growing list of available catalysts.

The luncheon session, attended by approximately 150 registrants, saw Grant Ehrlich, Resin Industries, Inc., introduce Miss Janis Wilson as "Miss Plastics of 1948." Miss Wilson, a movie starlet, entertained the assemblage with several songs and was presented with gifts made of plastic. Following the luncheon, M. Scott Moulton, B. F. Goodrich Chemical Co., spoke on "England and Her Plastics Industry." Mr. Moulton gave his observations of the British plastics industry as a result of his visit to England last October. As his principal interests are vinyl resins, he was particularly impressed with the results the British had been able to obtain despite lack of heavy machinery, particularly in the field of resin pastes. The speaker displayed samples of coated fabrics and cast toys made from vinyl pastes.

The second speaker at the luncheon was William T. Cruse, SPI executive vice president, who discussed "SPI Current Developments of Concern to the Industry." Mr. Cruse gave an inspiring picture of the progress of the plastics industry during the past 10 years, stressing the proper application of plastics in finished goods. The future of plastics is not dependent only on proper application, the speaker pointed out, but also on the development of new applications in consumer goods where plastics have never come into their own. The present average consumption of 7.5 pounds of plastics per capita in this country can be expanded to at least 10 pounds per capita provided ingenuity and thought are adequately applied to the progress of the industry.

The afternoon session was devoted to a merchandising forum with a panel comprised of M. R. Baruh, Fibreboard Products, Byron Dawson, *Sunset Magazine*, Brandt Goldsworthy, Industrial Plastics Corp., John M. Bridgman, McCann Erickson, Inc., Ford Samis, market economist, Stan Gray, Southern California Plastic Co., Harry Greene, Industrial Design Associates, and Irving Windman, Windman Bros. This forum was followed by a business meeting of the Pacific Coast Section.

A materials suppliers' cocktail party was held in the evening, prior to a banquet attended by some 250 members and guests. At the banquet Mr. Gutsch presented the new officers of the Pacific Coast Section, and E. McKenzie Stuart, Broadway Department Store, Los Angeles, had for his topic "The Sales Approach to the Retail Store."

Low-Pressure Plastics Seminar

The SPI Low-Pressure Industries Division will hold an industry-wide seminar on June 29 and 30 at the Statler Hotel, Washington, D. C., to foster an exchange of information between industry and government bureaus on the latest developments, techniques, and future requirements of government agencies in the use of low-pressure plastic materials. Participating will be representatives of the Armed Forces, the National Bureau of Standards, and plastics companies in the low-pressure field. Robert J. Brinkema, Egmont-Arens, Inc., is chairman of the Division, and S. T. Harris, Lincoln Industries, Inc., is chairman of the program committee for the seminar.

Plastic Problems Pondered on at SPE Section Meetings

THE Central Ohio Section, Society of Plastics Engineers, held a dinner-meeting March 11 at the Mound Builders' Country Club, Newark, O., attended by some 50 members and guests. Speakers were J. W. Knight, Fabri-Form Co., who discussed "Some Recent Phases of Fabricating Techniques," and W. W. Pedersen, Dow Corning Corp., whose topic was "Silicones as Engineering Materials."

Mr. Knight's talk, given by popular request, was identical with the paper he presented before the Society's national meeting in Detroit, Ill., during January and reported in our March issue, page 755. Mr. Pedersen's talk covered established and new uses for all types of silicone polymers. His discussion of silicones as high-temperature lubricants and in heat and electrically resistant laminates was based on the custom building of special types of polymers to meet specific applications.

Hints on Plant Reorganization

The March 25 meeting of the Eastern New England Section, in the Puritan Hotel, Boston, Mass., featured a talk on "Reorganizing Your Plant," by George V. Sammet, Jr., of Northern Industrial Chemical Co. As an approach for new plant developments, Mr. Sammet suggested the use of the process chart to show the present production system. Such a chart will show what is taking place, the work done on and by paper, the personnel concerned and their responsibilities, and bottle-necks and slowly operating sections of the present system. This chart should be analyzed to eliminate duplication of effort and unnecessary paper work and personnel.

The first step in developing the proposed new method is drawing up a new process chart, the speaker emphasized. Into this chart should go the application of production planning and control by departments and by the entire factory, load files and operations, load charts, planning and scheduling sheets, follow-up methods, allocation of personnel responsibilities, and other pertinent factors. Installation of new methods should be done in one department at a time and should be accompanied by the development of production boards and work station boards in each department. Other suggestions advanced by the speaker for installation of new methods include a campaign of education for key men and other personnel, installation of load files, development of new paper forms, and installation of master records for customer specifications and manufacturing operations.

Methods of Extruding Plastics

The Chicago Section heard a discussion of "Extrusion" by Paul Fortner, plastics division, E. I. du Pont de Nemours & Co., Inc., at the April 6 meeting in the Merchants & Manufacturers Club, Chicago, Ill. Mr. Fortner reviewed the standard methods of extruding plastics and described recent advances which have been made in equipment and in heat control media. While there is still much room for improvement in extrusion methods and each plastic presents its own particular problems, it is possible to work out processing methods that will accomplish the desired end in every case. The speaker em-

phasized the necessity of consulting the plastics supplier for recommendations on extrusion methods to find out what deviations from standard practices are possible or desirable. Even in the same family of plastics enough differences in properties exist to necessitate the use of modifications in extrusion methods.

To illustrate the extrusion problems which a plastics engineer must solve, Mr. Fortner described specific methods for extruding acrylics, Polythene, and several types of nylon. With acrylics, special consideration must be given to elimination of weld lines which are weak points and potential trouble spots. A relatively long die is usually employed, together with a specially designed cooling trough. Polythene is relatively easy to extrude because of its wide extrusion temperature range. While it is desirable to keep the temperature fairly constant, the point at which it is kept constant is not too critical. The use of circulating hot water in the cooling trough to improve the clarity of Polythene extruded through wide slots was also described by the speaker.

Address Cleveland Section

The Cleveland Section, held a regular dinner-meeting on March 26 at Brown's Cottage Dining Room, Cleveland, O., C. E. Dawson, president of Dawson Associates, spoke at the technical session on "Precision Casting of Stainless Steel Molds." Mr. Dawson gave an informative and interesting talk on the process of centrifugally casting stainless steel for the manufacture of die cavities. After dinner, C. F. Prutton, head of the department of chemical engineering at Case Institute of Technology, spoke briefly on "Education of the Future Members of the Plastics Industry." The Section's next meeting will take place on April 30 at Case Observatory, Cleveland. There will be a talk by an Observatory staff member followed by observations through the telescope, weather and atmospheric conditions permitting. The meeting will be preceded by a dinner at a site to be announced.

Large *Versus* Small Molds

The use and advantages of large multiple-cavity molds *versus* small molds was the subject of a combined meeting of the New York and Newark sections, SPE, on April 14, at the Newark Athletic Club, Newark, N. J. Some 160 members and guests heard Mario Petretti, Noma Electric Corp., speak on "Considerations in Favor of Large Multiple-Cavity Molds." Wes Larson, DeBell & Richardson, Inc., was to have spoken on "Considerations in Favor of Small Molds," but was unable to attend because of illness, and this topic was discussed by H. M. Richardson.

Mr. Petretti gave a step-by-step pattern of considerations involved in the choice of equipment, preforming, types of molds, finishing, and production rates and costs for large molds. The talk was of a highly practical nature and illustrated by means of photographs, samples of molds and molded parts, and discussions of examples taken from the speaker's experience. Mr. Petretti's paper will be printed in a future issue of India Rubber World.

Mr. Richardson said that although large multiple-cavity molds have their undenied advantages, five factors other than type of part determine the size of mold to be used for a particular job: (1) A tentative estimate of the total number of cavities needed, determined by the production rate, length of run, type of mold, production output per cavity per hour, etc., all of which are dependent on other factors. (2) The number of cavities per mold, determined by the size of the press, the part, pressures during molding, and the material being molded. (3) The maximum number of safe cavities per mold, which depends on the type of mold. A semi-positive mold, for example, has definite limitations which depend on clearance or leakage and on variations in cavity loading. An overload in any cavity may cause depressions of that mold cavity into the mold frame. (4) Choice of type of mold; a flash mold is useful where the maximum strength of the material being molded is not needed; a semi-positive compression mold gives more uniform density of molded material and, therefore, more strength; and a transfer mold gives full strength and is suitable for close tolerances and intricate sections. (5) Cost considerations. These may be best determined, Mr. Richardson said, by setting up a table showing direct comparisons for each type of molding in labor cost, yield and spoilage, number of changes per hour for the operator, mold cost *versus* mold life and production, molding material cost per part plus waste, mold maintenance and liability, finishing costs, inspection costs, and other applicable overhead and production costs.

No business session was held, but several announcements were made prior to the technical papers. Newark Section president, James T. Growley, Celanese Plastics Corp., introduced Arthur Nuier, Bakelite Corp., president of the New York Section. After the distribution of two door prizes, John Currier, Bakelite Corp. and Newark group program chairman, announced that the two groups were planning to hold a combined golf outing on or about June 10. Joe Joyce, Plaskon Corp., who has been making preliminary arrangements for the outing, said that present plans call for the outing to be held at the Twin Brooks Country Club, in New Jersey, and that a committee will be selected to make final arrangements pending approval by the group memberships.

The New York and Newark sections will hold another combined meeting on May 11 at the Hotel Sheraton, New York. Herbert Spurway, Boonton Molding Co., will speak at this meeting on "Production Control as It Is Applied to a Plastic Plant."

New Thermoplastic Material

VERSALITE, a new thermoplastic material that is tough, light in weight, and easy to form into compound shapes, is being manufactured by United States Rubber Co., Rockefeller Center, New York, N. Y. Said to be in the acrylonitrile group, the material is a combination of resins and elastomers plasticized with an elastomer. Non-corrosive and stable under changing atmospheric conditions, the product has exceptional electrical insulating properties and a low rate of heat conductivity, it is claimed. Because of its high impact strength, low water absorption, and excellent insulating properties, it is being used for a new type of shipping container for dry and frozen foods, as well as in home freezers, commercial freezing units, and other products. Future planned applications include luggage, radio cases, and component parts for boats, automobiles, buses, airplanes, and trains.

Typical Molded Parts Made from U. S. Rubber's New Thermoplastic Material, Versalite

Versalite can be formed into irregular and compound shapes as large as five by ten feet and can be made in almost any thickness above 0.020-inch. It can have solid color throughout, with either dull, satin, glossy, or embossed finish, will not chip or warp, and is highly resistant to gasoline, oils, and most commercial cleaners. Some properties of the material include: softening point, 160-220° F., depending on the particular compound; tensile strength, 2,000-9,000 p.s.i.; flexural strength, 5,000-14,000 p.s.i.; elongation, 25-130%; Izod impact, 10-18 ft.lbs./in.; dielectric constant, 3-14 at 50% RH and 60 cycles, and 2.7-8 at 50% RH and 1,000,000 cycles, depending on formulation; modulus of elasticity, $1.5\text{-}2.3 \times 10^5$ p.s.i.; water absorption, 0.16-0.40%; Rockwell "R" hardness, 40-105; specific gravity, 1.04-1.15; mold shrinkage in compression, 0.002-0.003 in./in.; and dielectric strength, 160-1,020 volts/mil at 50% RH and 60 cycles.

The rubber company controls the making of the material from base resin to finished product. Methods of bonding the material to itself or to other materials in production have also been developed. Cutting, drilling, and punching can be accomplished by use of ordinary wood or metal working equipment. Because of its ease in forming, Versalite opens new fields for elaborate designs without the need of expensive tooling and finishing operations.

Plastics Developments for Paper

"DEVELOPMENTS in Coatings, Impregnants, and Saturants for Papers" was the subject of a meeting of the Chicago Professional Paper Group Section of the Technical Association of the Pulp & Paper Industry on March 23 at the Chicago Bar Association, Chicago, Ill. Approximately 200 members and guests attended the meeting, which featured two technical papers and lively periods of discussion.

Edward G. Partridge, director of research for American Anode, Inc., spoke on "Latex Compounds for the Paper Industry," assisted by R. T. Henson, of the same company. Dr. Partridge's paper is published in full on pages 221-223.

"Heat Sealing of Thermoplastic Papers" was the second talk, by James H. Carter, sales manager of Nashua Gummed & Coated Paper Co. The speaker described the use of Thermocoat sealing methods and the general use of thermoplastics for sealing paper and applying labels. Important variables in the processes are time of application, temperature, pressure, and insulating properties of the paper, and a change made in one variable will require

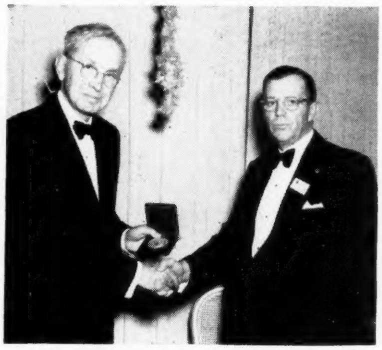
(*Continued on page* 246)

Scientific and Technical Activities

Goodyear Medal Awards and 25-Year Club Luncheon Feature Chicago Rubber Division Meeting

THE fifty-second meeting of the Division of Rubber Chemistry, A. C. S., held at the Hotel Sherman, Chicago, Ill., April 21 through 23, as a part of the one hundred-thirteenth meeting of the Society, was noteworthy for the many special features included in the program and for the many interesting papers presented at the technical sessions. Chairman Harry Outcault, the officers and directors of the Division, and the local committee on arrangements are to be congratulated for arranging such a fine meeting.

The first meeting of the Division's 25-Year Club was held at a luncheon at the Hotel Sherman on April 21, and an attendance of 136 members of the Division of Rubber Chemistry was recorded. The Goodyear Medal was presented to George Oenslager at the banquet of the Division the evening of April 22, and at the last technical session the morning of April 23, Goodyear Medals and certificates of award were presented to past medalists, L. B. Sebrell, Goodyear Tire & Rubber Co.; W. L. Semon, The B. F. Goodrich Co.; and Ira Williams, J. M. Huber Corp. The Goodyear Medal was not actually designed and available at the time the former medalists had been chosen. It was also announced that a Goodyear Medal will be presented to the first recipient of this honor of the Division, David Spence, at the meeting to be held in Los Angeles, Calif., in July of this year.



George Oenslager Receiving Goodyear Medal from Chairman Harry Outcault

The 25-Year Club Luncheon

H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., chairman of the 25-Year Club committee, first mentioned that the decision to form this new organization within the Division had been made at the last A. C. S. meeting in New York as a means of getting the old timers together and continuing old contacts and friendships. Dr. Winkelmann then turned the meeting over to R. P. Dinsmore, Goodyear, the luncheon chairman, who expressed his appreciation for the large attendance and then asked for comments from several well-known old-time members regarding their opinion of the desirability of the new organization. The comments were all favorable, and decision to form a 25-Year Club was confirmed by a show of hands of those present at the luncheon.

Dr. Dinsmore appointed W. G. Nelson, United States Rubber Co., Detroit, Mich., as chairman for the next meeting of the Club, to be held in connection with the meeting of the Division at Detroit in November.

A committee to obtain final approval from the Division of Rubber Chemistry and the American Chemical Society for the formation of the Club and to decide whether the present name was satisfactory was also appointed. W. O. Hamister, U. S. Rubber, is chairman of this committee, and other members are C. R. Haynes, Binney & Smith Co.; and C. W. Christensen, Monsanto Chemical Co.

A committee to decide on qualifications for membership in the new organization consists of B. R. Silver, N. J. Zinc Co., chairman; and J. P. Coe, U. S. Rubber; E. R. Bridgwater, E. I. du Pont de Nemours & Co., Inc.; C. P. Hall, C. P. Hall Co.; and Dr. Winkelmann.

The nominating committee has as chairman, E. B. Curtis, R. T. Vanderbilt Co.; and as members S. M. Cadwell, U. S. Rubber Co., and F. S. Malm, Bell Telephone Laboratories.

The large attendance and the interest shown by those present at the initial meeting of the 25-Year Club give indication that the decision to form such a Club was timely and that it will contribute much to meetings of the Division of Rubber Chemistry in the future.

The Technical Sessions

Harry Outcault, St. Joseph Lead Co., Division chairman, opened the first technical session on Wednesday afternoon by welcoming the members and guests present at the meeting and reminding his audience that much of the success of meetings of the Division depend on the efforts of the authors of the papers that are given. He pointed out that the year 1948 was the twenty-ninth instead of the twenty-fifth anniversary of the formation of the Division of Rubber Chemistry, as incorrectly printed on the program. Attention was called to the other meetings to be held during the year, one at Los Angeles, Calif., in July, and the other at Detroit in November.

R. C. Dale, Inland Rubber Corp., chairman of the local committee, also extended the welcome of the local committee and the Chicago Rubber Group to the members and guests and reminded them of the names and functions of the various members of the local committee.

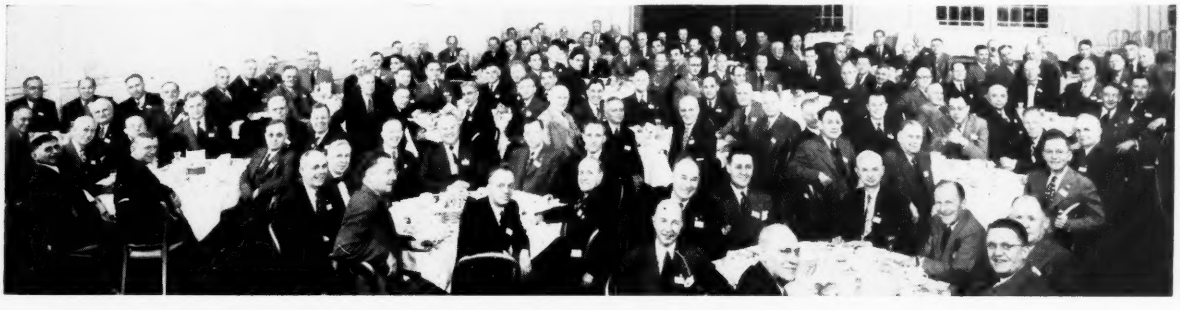
The technical program, which included 28 papers dealing with such topics as (1) the preparation and properties of synthetic rubber, (2) non-discoloring antioxidants for synthetic rubber, (3) carbon blacks and factors affecting their use, (4) vulcanization, (5) the use of petroleum products in rubber compounding, and (6) analytical and physical testing procedures, was well received. Abstracts of these papers appeared on pages 758 through 762 of the March issue of INDIA RUBBER WORLD.

The Business Meeting

At the regular business meeting on Thursday morning Mr. Outcault emphasized that the July meeting at the Hotel Mayfair in Los Angeles was a regular, not a regional meeting. He called on D. C. Maddy, Harwick Standard Chemical Co., chairman of the local committee for the L. A. meeting, who urged as many members as possible to attend. It was explained that there would be three half-day sessions and that the deadline for papers for this meeting was May 26. Abstracts or manuscripts should be submitted to C. R. Haynes, % Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y.

It was announced that the local chairman for the Detroit November meeting was C. W. Selheimer, of U. S. Rubber.

It was also announced that the 1949 meeting of the American Chemical Society will be held as follows: the spring meeting at Houston, Tex., and the fall meeting at Atlantic City, N. J. Mr. Outcault stated that the Division of Rubber Chemistry had decided to meet separately at Boston, Mass., in the Spring of 1949 and to meet with the Society at Atlantic



Inaugural Luncheon—25-Year Club of Rubber Division

City in the fall of that year. At the Boston meeting of the Division the next Goodyear Medalist will be honored, and it was also mentioned that 1949 would be the thirtieth anniversary of the Rubber Division and the 110th anniversary of the discovery of vulcanization.

A report of the membership committee was given by its chairman, J. C. Richards, Jr., B. F. Goodrich Chemical Co. A total of 152 new regular and 50 associate members has been added to the list of the Division of Rubber Chemistry, and 33 new members have been obtained for the Society.

The nominating committee to select candidates for the officers of the Division for 1949 was appointed under Harold Gray, Goodrich Co., as chairman. Other members of this committee are: J. T. Blake, Simplex Wire & Cable Co.; R. F. Dunbrook, Firestone Tire & Rubber Co.; J. W. Temple, U. S. Rubber; and Mr. Hall.

During the business meeting Mr. Dale took the occasion to thank the members of the local committee on arrangements for their work, and C. M. Baldwin, United Carbon Co., chairman of the committee for the suppliers' cocktail party, thanked the numerous contributors who had made this party possible.

Mr. Outcault called attention to the fact that the Division was operating for the first time in 1948 under a new constitution with representation on the board of directors from the sponsored local rubber groups. He reminded the members that matters concerned with the business of the Division should be handled through these local group representatives.

Mr. Outcault also reminded the members that the services of the comprehensive library being operated by the Division are available through local libraries in the areas where members live. At present the major use of this service is by members in the Akron area, but it can be used with almost equal ease by members of the Division in other parts of the country, if they will channel their requests for special literature through their local libraries.

The Charles Goodyear Medal for 1949 will be awarded to Harry L. Fisher, U. S. Industrial Chemicals, Inc., at the Boston meeting, Mr. Outcault reported. Dr. Fisher will present a paper at that meeting upon receiving the award.

H. E. Simmons Delivering Medal Award Address

The Division Banquet

The regular banquet of the Division of Rubber Chemistry was held in the grand ballroom of the Hotel Sherman on Thursday evening. The banquet was preceded by a cocktail party in Exhibition Hall. This so-called "suppliers" party, which has been arranged for on a cooperative basis by the numerous companies supplying chemicals, machinery, etc. to the rubber industry at recent meetings of the Division, was again one of the special features that was handled in a very fine manner by Mr. Baldwin and his committee at the Chicago meeting.

The banquet itself was an outstanding event in that it was highlighted by the presentation of the Charles Goodyear Medal for 1948 to George Oenslager, for many years a research chemist for The B. F. Goodrich Co. and now a consultant for that company. The life and the career of the medalist were reviewed in a talk by H. E. Simmons, president of the University of Akron. In honor of the occasion, previously designated Goodyear medalists, Drs. Sebrell, Semon, and Williams, were seated at the speakers' table, together with many of the past chairman of the Division, officers and directors of the Division, the chairman of the Chicago Rubber Group, W. N. Crumpler, Geo. S. Mepham Corp., and special guests of the Division, Alden H. Emery, executive secretary of the Society, and Walter H. Murphy, editor of *Industrial and Engineering Chemistry* and *Chemical and Engineering News*.

Dr. Simmons described first the modest and human qualities of Dr. Oenslager with special reference to the difficulty in convincing him to accept a previous honor, the Perkin Medal in 1933. He then mentioned some of the problems of the medalist at Harvard University in following through his determination to study chemistry, and the speaker also described, by citing examples from life of Dr. Oenslager, his personal philosophy with regard to loyalty, philanthrophy, science, and religion.

The work with resinous rubber that lead to the discovery of organic accelerators of vulcanization was followed by an investigation of the use of carbon black instead of zinc oxide to give longer service in automobile tire treads, and the results of Dr. Oenslager's research benefited the ultimate consumer of tires and produced a new industry, Dr. Simmons pointed out.

Details of the Medalist's earlier work with mercuric iodide as a vulcanization accelerator and the difficulties experienced in launching the first carbon black tires were also related to round out this story.

It was also mentioned that the medalist worked out a method for the vulcanization of hard rubber at the boiling point of water, based on his conviction that the mechanism of hard rubber vulcanization was not different from that of soft rubber vulcanization.

The presentation of the Goodyear Medal was made jointly by W. W. Vogt, Goodyear, chairman of the Medal Award Committee, and Mr. Outcault as chairman of the Division.

The banquet program was concluded by entertainment in the form of several excellent variety acts, which were enjoyed by the members and guests present.

Final Session

The final technical session on Friday morning, April 23, included a brief talk by F. D. Ascoli, of London, England, on behalf of the London Technology Conference in June and the presentation of the Goodyear Medal and Award Certificates to Drs. Sebrell, Semon, and Williams.

Mr. Ascoli expressed his appreciation of the hospitality extended to him during his visit to the Rubber Division meeting and urged as many members as possible to attend the 1948 London Technology Conference in June.

He said that England's "austerity" program notwithstanding, adequate arrangements were being made.

Because it was necessary to await the design and preparation of the Goodyear Medal, the three medalists, from 1943 to 1948, had not as yet received their medals; so in a brief ceremony on Friday morning these medals were presented to Dr. Sebrell, who was designated in 1943, and to Drs. Semon and Williams, who were designated in 1946. With the presentation of a Goodyear Medal to David Spence, who was designated in 1942, at the July Los Angeles meeting, the Division will have finally discharged its obligations in full to all medalists chosen to date.

Speakers' Table at the Division Banquet, Hotel Sherman, April 22, 1948; Seated from Left to Right: N. A. Shepard, E. B. Babcock, Ira Williams, Waldo Semon, E. R. Bridgwater, H. L. Fisher, C. R. Haynes, W. W. Vogt, George Oenslager, Harry Outcault, H. E. Simmons, H. I. Cramer, C. C. Davis, R. P. Dinsmore, C. W. Christensen, H. A. Winkelmann, Simon Collier, E. B. Curtis, L. B. Sebrell, and S. G. Byam; Standing, Left to Right: E. Krismann, C. R. Cuthbertson, J. C. Walton, L. A. Murray, Jr., A. R. Kemp, J. H. Fielding, A. H. Emery, S. M. Cadwell, H. L. Trumbull, J. H. Ingmanson, G. K. Hinshaw, A. M. Neal, R. H. Gerke, J. C. Richards, Jr., John T. Blake, Walter J. Murphy, B. S. Garvey, Jr., and W. N. Crumpler

C.I.C. Rubber Division Abstracts

THE Rubber Division of the Chemical Institute of Canada will hold a technical session on June 9 at the Windsor Hotel, Montreal, P. Q., as part of the Institute's annual conference on June 7 to 10. M. F. Anderson, Dominion Rubber Co., Ltd., chairman of the Division, will preside. The Rubber Division program will be of interest to members of both the Canadian and the American rubber industry, and an invitation is extended to American technical men to attend the meeting. Abstracts of the papers to be presented follow.

Deformation Characteristics of Rubber or Rubber-Like Compounds as a Measure of Quality, Especially in Control. Ultimate tensile strength, for a long time the yardstick of rubber compound quality, is no longer adequate and often is impractical. Hardness, modulus at definite elongation, load deflection curves, and various other deformation characteristics are more reasonable properties to evaluate. This paper will cover a discussion of hardness testers and their calibration, the use of modulus testing in control work, and some notes of recent mechanical goods evaluations. The practical side rather than the theoretical aspect of testing will be stressed. Leslie V. Cooper, Firestone Tire & Rubber Co., Akron, O.

Quality Control of Factory Mixed Batches of Rubber Compounds. Control chart methods can assist in controling the uniformity of batches of compounded rubber stocks by improving interpretation of tests on measurable qualities, analyzing charts from process recorders, and providing a continuous record of various inspections. Statistical theory plays an important part in the interpretation of data. Processed material by any test will vary, but if the variation arises from a constant system of causes, the variability will be uniform and confined to predictable limits above and below an average value. When observations fall outside these statistical limits (which may differ from specification tolerances), they are probably influenced by some unusual cause of variation, and the test or material should be investigated further. Thus the emphasis is shifted, for instead of simply accepting a given batch for further processing or rejecting it, the data are used as a test for homogeneity of the process. If a test indicates that a batch is significantly different from its predecessors, an attempt is made to find and remove undesirable causes. This paper assumes some elementary knowledge of chart control techniques and by discussing typical applications emphasizes results which can be obtained from the use of chart control methods. P. E. Gnaedinger, Dominion Rubber.

Oxidized Lignin as a Reinforcing Agent for Rubber. It has been found that alkali lignins, as separated from the spent digestion liquors from the alkaline pulping processes by conventional methods, give greatly enhanced reinforcing properties to GR-S if the lignin is subjected to oxidation prior to its incorporation in the rubber masterbatch. R. A. V. Raff and G. H. Tomlinson, Howard Smith Paper Mills, Ltd., Cornwall, and T. L. Davies and W. H. Watson, Polymer Corp., Ltd., Sarnia, both in Ont.

Lignin as a Stabilizer in GR-S. Lignin has been found to be an effective stabilizer for GR-S. As a stabilizer of the raw polymer, lignin is markedly superior to presently used antioxidants. As a stabilizer of the vulcanized compounds, it is at least as good as the best of the presently used materials. Lignin is a non-staining and non-discoloring stabilizer which pigments the polymer only slightly. As a consequence, it can be used effectively in light colored, compounds. W. H. Watson.

The Formation and Structure of Vulcanizates. Simplified methods of vulcanization and recently developed network theories have been used to determine the relation between vulcanizate structure and properties. A vulcanization technique which avoids most of the conventional compounding steps has been developed. Free radical attack on the polymer in the form of emulsion particles results in a smooth cross-linking reaction which proceeds at a satisfactory rate at moderate temperatures. Although most of the investigation has dealt with butadiene-styrene copolymers (GR-S), the reaction appears to be general for diene polymers. For a given chemical composition two of the important structural elements would seem to be the concentration of cross-linkages and the molecular weight of the raw polymer. There is little agreement in either rubber theory or technology on the effect of these structural factors on vulcanizate properties, largely because of the difficulty of estimating the concentration of cross-linkages. The recently developed theory of gelation, however, relates this quantity explicitly to the solubility. On this basis it can be shown that less than 1% of the structural units in a typical vulcanizate is involved in cross-linkages. The dependence of elastic modulus on concentration of cross-linkages is found to be linear when the molecular weight is fixed. The modulus, however, diminishes as the molecular weight is decreased. The effect is identical with that found by Flory for a series of fractions of Butyl rubber. The dependence on molecular weight is believed to arise from the fact that each unbranched molecule eventually gives rise to two "loose ends" in the network structure. Such "loose ends" are flaws in the vulcanizate structure. Impairment of certain physical properties can be expected to depend on the number of such flaws, i.e. inversely on the average molecular weight. J. A. Bardwell and C. A. Winkler, McGill University, Montreal.

The Role of Aggregating Conditions and Particle Fusion in the Growth of Polymer Particles during Emulsion Polymerization. The theory that particle size will be proportional to the condition of stability existent in the polymerizing system enables one to regulate particle size very effectively and to predict the effects which various conditions or reagents will have on particle size. Destabilizing aids of various types favor large-particle formation; stabilizing aids of various types favor small-particle formation. The large amount of research and production experience has demonstrated the soundness of these views. The destabilizing conditions that lead to large-particle formation may be brought about by: (a) low soap content; (b) poor soap; (c) low pH; (d) salts, particularly sodium salts and other stabilizers; and (e) low temperatures. C. E. Rhines and J. McGavack, United States Rubber Co., Passaic, N. J.

Vinyl Paste Technology. This paper will concern vinyl paste formulating and processing, with special attention to recent improvements which have widened the field of usefulness of this form of resin. A vinyl paste is a mixture of resin and plasticizer which is unique in being a liquid at room temperature and yet capable of conversion to a solid form by application of heat. In the process of heat-setting there is no volatilization of liquid material, and, as a consequence, no shrinkage or blistering. Vinyl pastes, therefore, provide a means of shaping the plastic without recourse to heavy equipment or to use of volatile solvents. English manufacturers have led in adapting these valuable properties to their needs, and the speaker will show samples and describe operations he has witnessed in England. The new process should interest vinyl products manufacturers who desire to expand their operations quickly and at a moderate cost. M. Scott Moulton, B. F. Goodrich Chemical Co., Cleveland.

Impact Resistant Rubber-Resin Blends. Moderate loadings of modified high styrene resin polymers are finding widespread use as reinforcing materials for rubber compounds. Investigations of compounds in the high resin-low rubber range have also produced many interesting properties. Among these are stocks which exhibit high impact resistance while maintaining the hardness and rigidity of the resin. These rubber-resin blends can be milled on conventional rubber equipment and compounded to improve properties such as hardness, stiffness, and abrasion resistance and to obtain a wide range of colored stocks. This paper deals with the use of numerous rubbers as plasticizers, the physical properties which can be obtained with various rubber-resin ratios, and compounding variations in these stocks to improve specific properties. H. S. Sell and R. J. McCutcheon, Goodyear, Akron.

A Moisture - Insensitive Accelerator System for Elastomers. The effect of moisture on the cure rate of natural and synthetic elastomers introduces another variable in the vulcanization process, and serious proposals for complete humidity control of pigment storage, rubber storage, and compounding rooms have been put forward in an attempt to counteract this effect. A new approach is taken here, that of developing a curing recipe that is insensitive to concentration of moisture in the compounded stock and which will give the same rate of cure for any amount of moisture present, within very broad limits. A successful accelerator combination is given together with the range of moisture content in which it has shown itself to be moisture-insensitive. S. T. Bowell and N. R. Legge, Polymer.

Comparison of Synthetic and Natural Rubbers in Tires and Tubes, Footwear, and Mechanical Rubber Goods. This is a combined paper by three authors representing three different branches of the rubber industry in Canada. A comparison of synthetic and natural rubbers is made from the point of view of the rubber manufacturer, under the headings of raw properties, processing characteristics, physical properties, and quality of finished products. G. R. Smye, Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., A. B. Lewis, British Rubber Co. of Canada, Ltd., Montreal, and C. L. Brittain, Gutta Percha & Rubber, Ltd., Toronto, Ont.

Water Soluble Phenol-Aldehyde Resins for Impregnating Woven Brake Linings and Asbestos Paper Clutch Facing. A water soluble phenol-aldehyde resin has proved to be satisfactory for the manufacture of woven brake linings and paper clutch facings. Rigidity, color, and friction were adequate, and brake squeal was absent. Resins of higher and lower friction were obtained by the same technical process; this modification resides in the relative molecular proportions of the chemical constituents. R. Destert, University of Montreal.

Papers on Latex Presented before New York Group

TWO talks on latex featured the spring meeting of the New York Rubber Group on April 2 at the Henry Hudson Hotel, New York, N. Y. Approximately 250 members and guests attended the afternoon technical session, at which papers on "Commercial Aspects of Natural and Synthetic Latices," by Robert V. Yohe, president of American Anode, Inc., and "Recent Developments in Latex Technology," by Royce J. Noble, executive vice president of Heveatex Corp., were given. Dr. Yohe was unable to attend, because of illness in his family, so his paper was read by Dwight L. Allen, sales manager for American Anode.

During 1941 approximately 640,000 long tons of dry rubber and 22,000 long tons of latex were used in this country; while in 1947, 1,122,000 long tons of dry rubber, both natural and synthetic, were consumed together with approximately 43,000 long tons of latex, both natural and synthetic, Dr. Yohe wrote. The ratio of latex to dry rubber consumption therefore increased from a little over 3% to more than 4.5% during the period when the most valuable latex, natural latex, was in its shortest supply. It is estimated that consumption of all types of latices in this country during 1948 will be about 54,000 long tons, and it can be safely predicted that the ratio of latex consumption to dry rubber consumption will continue to show a marked increase in the years to come.

Dr. Yohe stated his belief that many products now being made by conventional dry rubber and dry processing methods will eventually be converted to methods which take advantage of the liquid form in which latices are made available. Present large-volume uses of latices include sponge, tire cord dipping, toys and balloons, druggists' sundries, adhesives, coatings, impregnants, and sheetings. Where the latex industry has failed to date is in its inability to manufacture items from latex which comprise the greatest volume usage for rubber. If it were possible to develop a latex compound which had the abrasion resistance of a tire tread stock, it would be almost possible to manufacture tires directly from latex. Such a process may some day be developed, but it is important that, in the meantime, we learn how to manufacture miscellaneous mechanical items now made from dry rubber directly from latex or compounded latices.

Dr. Yohe further stated that the price of natural latex is too high at present. "The present relationship between the price of crude dry rubber and natural crude latex is not realistic, and I am further confident that until natural crude latex may be landed in this country at 25¢ a pound, its use will be restricted."

If natural latex cannot be produced with a reasonably small differential over the cost of producing dry smoked sheets, then eventually a synthetic material will be developed which will take the place of natural latex.

Work on such a synthetic material is being done, and the speaker listed available synthetic latices including natural, neoprene, Hycar, Dow butadiene-styrene, GR-S, Geon latices and polyblends, Saran, and polyvinyl butyral types. Only a slight modification of polymerization technique would make GR-S latex a very satisfactory replacement for natural latex. The future of neoprene latex depends on the development of low-cost acetylene; Hycar and its counterparts, on the development of low-cost acrylonitrile; Geon and other vinyl latices, on acetylene and plasticizers; and all of these latices on continuous polymerization methods.

Dr. Yohe's paper concluded with three predictions: (1) The price of natural latex will be reduced very soon and will be 25¢ a pound by year end, resulting in an important expansion of use. (2) An American-made butadiene-styrene latex will be developed within two years or less that will be at least a 50% replacement for natural latex for all uses. (3) The consumption of latices will be at least 10% and perhaps 20% of the total rubber consumption in this country within 10 years.

According to Dr. Noble, latex developments since 1940 have been mainly in the field of expanding old applications, rather than developing new uses. He then briefly mentioned different research work done on latices since 1940. Some work on miscellaneous natural latices, such as *Cryptostegia*, *Funtumia*, and others, took place during the war, but has now been discontinued. On the problem of latex preservation, work was done just before the war on the replacement of ammonia as a preservative. Ammonia affects latex, forms water-soluble ammonium salts, and increases the solubility of zinc oxide in latex, thus reducing latex stability. Other preservatives were sought, and the most promising appeared to be the chlorinated phenols, particularly the sodium salts. Some shipments were made with these materials before hostilities began and then were discontinued because of the war. Some work on the identification of the proteins contained in natural latex was also conducted. Dr. Noble agreed with the previously expressed belief of E. M. McColm, of United States Rubber Co., that too much work has been done on the non-rubber constituents of latex and not enough work on the rubber constituent.

In the field of synthetic latex, the speaker mentioned the development of the so-called reactive concentrates for use in sponge rubber and certain dipped goods. Work on producing high-solids natural latex has developed the electrodecantation method, which is a special form of dialysis to give concentrated latex. Some work on latex coagulation and creaming has been performed by the British and the Malayans. As for methods of testing latices, much work was carried out during the war, particularly on synthetic types. This work has now been picked up by A.S.T.M. for standardizing test methods on both natural and synthetic latices.

Little has taken place in the United States on impregnation and treatment of fibers with latex. Work has been done in England and is continuing on the use of quaternary ammonia soaps to change the electrical repulsion of latex and fibers and give tight latex deposits. Work is also going on on the use of wetting agents for certain types of fibers to improve latex impregnation. As for compounding latex to give products equivalent to those produced from dry rubber, as mentioned in Dr. Yohe's paper, Dr. Noble stated that some work has been done which indicates that carbon black and certain minerals have a definite, although small reinforcing effect in certain synthetic latices when used in small amounts.

In conclusion, Dr. Noble emphasized that wider use of latex will depend on much research and support. He believes that the price of latex will not drop greatly so long as the government supports the price of natural dry rubber and latex, labor, equipment, and shipping costs remain unchanged. Some reduction in the price of latex will take place by the end of this year, but this reduction will not be a great one, Dr. Noble said.

After the technical speakers a paper on the "History of the New York Rubber Group," by M. E. Lerner, editor of *Rubber Age*, and R. G. Seaman, editor of INDIA RUBBER WORLD, was read by Mr. Lerner. This paper, which will be published in the April issue of *Rubber Chemistry and Technology*, traces the development of the Group from its inception at a Rubber Division meeting in 1927 up to the present day.

After the talks, Chairman J. E. Waters, General Cable Corp., announced that the Group's annual outing will be held on June 26 at Doerr's Grove, Short Hills, N. J., with C. E. Jantzen, of *Rubber Age*, acting as chairman of the outing committee. Following the procedure initiated last year, the *Group's* golf tournament will be held separately from the outing. The golf tournament will be held on August 24 at the Winged Foot Golf Club, Mamaroneck, N. Y., with D. F. Cranor, Binney & Smith Co., J. H. Nesbit, U. S. Rubber Reclaiming Co., and E. B. Curtis, R. T. Vanderbilt Co., in charge of arrangements.

A cocktail hour was held after the technical session, followed by an excellent dinner attended by some 275 members and guests. Music was provided during the dinner and followed by entertainment in the form of several vaudeville acts.

Hycar-Felt Packings and Gaskets

FELT in combination with Hycar latex and sheet rubber, made by B. F. Goodrich Chemical Co., is being used by the American Felt Co. to produce mechanical sealing, packing, and gasketing materials for a host of industrial applications. Cut into strips and washers, these materials are marketed under the trade names, Vistex and Oil Foil.

Vistex is a Hycar latex impregnated and laminated felt-base packing and sealing material. By controlling the ratio of felt fiber to the amount of Hycar impregnant, self-lubricating properties are obtained. In proper balance, the felt fibers retain sufficient capillarity or wetting property to make a well-lubricated packing, and the Hycar latex saturation is complete enough to provide positive sealing against dirt and moisture, dimensional stability, and excellent resistance to oils and fluids. Present uses for Vistex include packing washers for fuel pumps, plunger seals, faucet seals and gaskets, and seals and washers for all types of organic solvents, oils, and fluids.

The Oil Foil seals combine in a single laminated bearing seal washer the conventional felt seal and one or more impervious septums of 1/64- or 1/32-inch Hycar sheet. Many types of Oil Foil washers can retain oil up to 400% of their weight and can bleed this retained oil to the point of friction if required. The Hycar septum on the outside washer surface prevents loss of lubricant and provides positive sealing. Present uses for Oil Foil washers include automotive, aircraft, and farm equipment, wheel and motor bearing seals, machine spindles and bearings, laundry equipment, refrigeration units, and other types of mechanical equipment requiring lubricated bearings with positive seal protection.

Rubber, Plastics Groups at Chicago Technical Conference

BOTH the Chicago Rubber Group and the Chicago Section, Society of Plastics Engineers, held panel sessions on March 24 as part of the program for the Chicago Technical Conference and Production Show on March 22 to 24, at the Stevens Hotel, Chicago, Ill.

Rubber Group Panel

Four talks by experts in their fields comprised the panel on "Engineering with Rubber," sponsored by the Chicago Rubber Group. H. A. Winkelmann, research director of Dryden Rubber Division, Sheller Mfg. Co., acted as chairman of the panel session.

The first speaker, B. F. Benson, Inland Rubber Co., discussed "Rubber Tires of the Future." He reviewed the progress made to date in adapting synthetic rubber to tire production and stated that future tire improvements will be along the lines of further development of the low-pressure tire, use of wire cords, improvements in nylon and rayon cord, and use of low-temperature polymerized butadiene-styrene rubber. This last development is of great significance to the tire industry, Mr. Benson said, and offers the greatest opportunity for independence of foreign raw material supplies.

"American Oil Resistant Rubbers" was the subject of the second paper, given by Allyn I. Brandt, general sales manager for B. F. Goodrich Chemical Co. Mr. Brandt described the development of the butadiene-acrylonitrile rubbers before the war, their wartime contributions, and some of the many applications which they have found since the end of the war. The talk emphasized the interesting engineering applications of the nitrile rubbers and the properties which can be obtained by use of these materials.

The third paper, presented by Calvin S. Yoran, research director of Brown Rubber Co., was "Engineering with Sponge Rubber." He described the various types of sponge rubber available and treated of the use of each type in specific products. The specifications set up by A.S.T.M. and S.A.E. have been of great help to the industry by providing manufacturers and consumers of chemically blown sponge rubber with a common language. The speaker also explained some of the principal engineering applications of sponge rubber in the automotive industry.

The final paper of the session, "Engineering with Adhesives," by Fred J. Wehmer, James O. Hendricks, and Gordon F. Lindner, of Minnesota Mining & Mfg. Co., was delivered by Mr. Wehmer, who emphasized the importance of proper preparation of the surfaces to be joined together to obtain maximum adhesion. The testing of adhesives has been neglected heretofore, but much work is now being done by A.S.T.M. and private companies to devise proper test procedures and write adequate specifications. A complicating factor in this work is the fact that the force required to separate two surfaces joined by adhesives depends greatly on the speed of removal and whether the force is applied in tension, shear, or some combination of these two. Prospects for growth of the adhesives industry by close cooperation between technical men in the field were also considered.

Plastics Panel Session

The panel session held by the Chicago Section, S.P.E., had as its subject, "Plastics in Production Design." A. H. Voss, Western Electric Co., was technical chairman of the session, and J. O. Reinecke, Barnes & Reinecke, Inc., was honorary chairman. Two papers were presented: "The Use of Plastics in Production Design as Viewed by the Engineer," by James A. Boyajian, president of Product Mfg. & Engineering Co.; and "Use of Plastics in Production Design as Viewed by the Consumer," by Willard L. Morrison, Jr., coordinator of industrial design for Montgomery Ward & Co.

Mr. Boyajian reviewed the qualifications needed by an engineer in order to specialize in production design of plastics; he also outlined the steps which an engineer takes in choosing materials, methods of fabrication, and test conditions for a plastic product. Manufacturers and designers are slow to adopt new methods and materials, the speaker stated, but close cooperation between designers and raw material suppliers helps bring new materials into use. Plastics are not cheap, and their successful use depends on adequate knowledge of the job, Mr. Boyajian emphasized. For example, in the case of molded plastics the engineer must know the importance of rounded corners, uniform and adequate thickness, reinforcement ribs, minimum flash lines, proper design to insure flow of material through the mold, and proper location of inserts.

Much has been said and written on consumer dissatisfaction with certain applications of plastics, Mr. Morrison said. Some of this criticism has been warranted, but, in general, the public is tolerant of misapplications and quick to forget mistakes. Plastics are not looked upon as a substitute material any longer, and the public accepts plastics as useful, necessary, and most desirable materials for many applications. The speaker urged a reduction in the bewildering maze of trade names for plastics and advocated the issuance of a glossary of trade names to sales clerks and consumers to guide them in selection of the proper material.

Quebec Group Hears Geldard

WALTER J. GELDARD, sales manager for rubber chemicals, Naugatuck Chemical Division of United States Rubber Co., spoke on "Current and Future Prospects in the Rubber Chemical Field" before the April 8 meeting of the Quebec Rubber & Plastics Group at the Ritz-Carlton Hotel, Montreal, P. Q. Approximately 45 members and guests heard Mr. Geldard review the development of organic rubber chemicals, particularly accelerators and antioxidants, from 1915 to date, and discuss the major classes by their applications and uses. With the introduction of synthetic rubber the emphasis on certain groups and individual chemicals was changed. Fortunately for the war effort, the existing rubber chemicals were applicable to the vulcanization of the new synthetics, the speaker said, and no basically new chemicals were needed or introduced during the war. Research and development programs reached maximum productivity between 1920 and 1935, and most of the recognized fields of possible profit in research have been thoroughly and extensively exploited.

For the future, new organic groups must be investigated, Mr. Geldard declared. New intermediates heretofore not available must be produced to offer practical starting points for new chemicals. The speaker concluded by suggesting the following desirable organic rubber chemicals for future consideration: (1) effective non-staining and non-discoloring antioxidants; (2) safer accelerators for high-temperature processing that would possess high activity at curing temperatures; (3) super flex-cracking inhibiters; (4) retarders that would be effective at processing temperatures and either ineffective or activating at curing temperatures; and (5) chemical plasticizers or peptizers to reduce the present high cost of preparing rubbers for processing.

The Group will hold its final meeting of the season on May 13.

Program on Machinery

A MEETING of the Philadelphia Rubber Group was held April 16 in Kuglers' Restaurant, Philadelphia, Pa. A large audience of members and guests heard E. S. Thompson, of Farrel-Birmingham Co., Inc., Ansonia, Conn., talk on "Recent Developments in Rubber and Plastics Machinery." In addition the Firestone sound film, "The Making of a Tire," was shown, preceding Mr. Thompson's talk. William B. Dunlap, Jr., Lee Rubber & Tire Corp., chairman of the Group, presided and introduced the speaker of the evening.

The speaker reviewed some of the general problems of the design of new machinery for the rubber and plastics industries and then explained in some detail recent efforts to improve such equipment as the two-roll mill, internal mixers, calenders, and calender auxiliaries. This very interesting paper appears in the article section of this issue, page 209.

The next meeting of the Group will be held on June 11, again at Kugler's Restaurant, at which time W. B. Reynolds, of Phillips Petroleum Co., will discuss "Philprene Low-Temperature Rubber."

Two subsequent meetings of this Group will be held on September 17 and December 3. The September 17 meeting will be the annual outing for the organization.

Jet Propulsion Discussed

THE March 26 meeting of the Chicago Rubber Group, at the Morrison Hotel, Chicago, Ill., was attended by 150 members and guests and featured a talk on "Jet Propulsion" by Major Howard T. Markey, commanding officer of the 42nd Air Reserve Fighter Squadron and one of the first test pilots to fly a jet plane. Major Markey described some of his experiences as a test pilot for five years and explained the operation of jet propelled airplanes. His comments on the German "Ram Jet," which theoretically could develop a speed of 3,500 m.p.h., aroused much interest in the audience and resulted in an extended discussion period.

Two sound films also were shown, the first on jet propulsion by General Electric Co., and the second on the testing of the captured German V-2 rockets by the United States Army.

Group Chairman William N. Crumpler announced that the next meeting, to be held May 7, would include elections of officers in addition to a technical talk. It was decided by the Group that, as in the past, at least two members be nominated for each office. The Group's annual golf outing is scheduled by July 17.

L. A. Group Hears Rostler

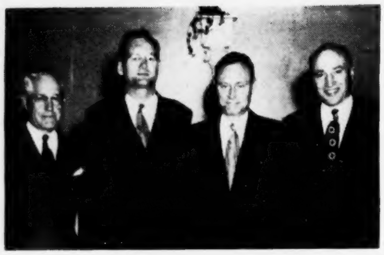
APPROXIMATELY 200 members and guests of The Los Angeles Rubber Group, Inc., attended a meeting on April 6 at the Mayfair Hotel, Los Angeles, Calif. At the afternoon technical session, presided over by George W. Miller, W. J. Voit Rubber Corp., Fritz S. Rostler, director of research and development for Golden Bear Oil Co., spoke on "Petroleum Products for Rubber." He discussed the underlying principles and major operations in the manufacture of petroleum products which are of interest to rubber compounders. Specifications, their background and significance were reviewed, and an over-all picture was presented of the origin, composition, manufacture, and inherent properties of these petroleum products. The talk was illustrated by tables and charts which were shown in a number of slides.

The meeting was sponsored by Goodyear Tire & Rubber Co. of California, and the company vice president, D. W. Sanford, welcomed the Group to another "Goodyear Night." Phil W. Drew, Group chairman and Goodyear technical superintendent, introduced the other Goodyear men present, including Factory Manager Frank Steele. Door and raffle prizes donated by Goodyear were won by the following: Goodyear tire, Gaelen Norton, of Kirkhill Rubber Co.; carpet sweeper, George Steinbach, Atlas Sponge Rubber Co.; radio, Howard Heilman, Consolidated Engineering Co.; picnic ice box, L. Reed Brantley, Occidental College; one dozen golf balls, J. Bristow, United States Rubber Co.; camp stove, D. W. Burson, H. M. Royal, Inc.; and a bale of GR-S, Fred Woerner, Reeves Rubber, Inc.

Dinner speaker was Cecil L. Dunn, chairman of the department of economics at Occidental College. Dr. Dunn's topic was "Depression Ahead?" It featured business cycles in the United States. The occurrence of these cycles has increased from seven years to four years and now down to 36 to 38 months, and the cycles have greater peaks and dips. The speaker stressed the powerful effect of the government fiscal policy on the business cycle. The United States has now grown up, Dr. Dunn said, and needs the foreign, fiscal, and tax policies of a mature nation.

Tlargi Golf Tournament

One of the finest golf tournaments ever held by the Los Angeles Rubber Group took place on April 9 at the Baldwin Hills Country Club, with 40 members and guests participating. After luncheon at the clubhouse the afternoon was given over to the golf tournament, with the following victorious contestants: low net, R. A. Lees, American Anode, Inc.; high gross, W. J. Haney, Kirkhill Rubber Co.; low gross, Earl Hensal, B. F. Goodrich Co.; low putts, Wilbur Johnson, E. I. du Pont de Nemours & Co., Inc.; most accurate approach, R. L. Roby, Accurate Products Co.; longest drive, J. G. Wilson, also of Accurate; and blind bogey, Ed Wilson, Golden State Rubber Mills. Appreciation for a fine affair was given to Al Federico, C. P. Hall Co., chairman of the golf committee, and his assistants, Tony Reznicek, W. J. Voit Rubber Co., and Ed Wilson, Golden State Mills. Mr. Federico announced that the Group will attempt to hold four tournaments each year in view of the keen interest aroused among the membership. The next tournament will be held on June 4 at the Wilshire Country Club.



At Los Angeles Group Meeting, April 6, (*L. to R.*): Frank A. Steele, Cecil L. Dunn, D. W. Sanford, and Phil W. Drew

To Prevent Deterioration

THE Washington (D. C.) Rubber Group held its second meeting on April 13 at the National Academy of Sciences Bldg. with 75 members and guests attending. Guest speaker was Glenn A. Greathouse, of the National Research Council, who discussed "Prevention of Deterioration of Materiel."

Dr. Greathouse began his talk with a history of the National Research Council since its establishment in 1916, then passed to a review of the formation and activities of the Council's Prevention of Deterioration Center. This Center acts in a consultant and advisory capacity to the Armed Services and other government branches, is active in the coordination of a program for testing compounds as fungicides and/or bactericides, publishes abstracts and comments on articles on this subject appearing in technical literature, is assisting in the preparation of a book on deterioration, and will answer questions on deterioration from private industry when the nature of the information requested is such that it can be disclosed. Turning to the subject of degradation of rubber products, Dr. Greathouse gave reviews of eight published articles on the prevention of deterioration of rubber when exposed to light, moisture, chemicals, and micro-organisms.

After the talk a question-and-answer period took place, followed by a showing of The B. F. Goodrich Co. film, "Rubber Lends a Hand." The Group's next meeting will take place on May 11 at the National Academy of Sciences Bldg.

Direct Determination of Oxygen in Organic Compounds

AN IMPROVED technique for the direct determination of oxygen in high molecular weight organic compounds has been developed by W. W. Walton, F. W. McCulloch, and W. H. Smith, of the National Bureau of Standards, Washington 25, D. C. By this method small amounts of oxygen, such as occur in natural and synthetic rubbers, in plastics prepared from hydrocarbons, and in mineral oils, can be measured with precision and accuracy. In this method a weighed sample is decomposed by heating in an oxygen-free helium atmosphere, and the oxygen compounds formed are converted to carbon monoxide by passage over carbon at 1120° C. The oxygen content of the material is then calculated from the percentage by volume of carbon monoxide in the collected gas as determined by the NBS carbon monoxide indicator.

When Is a Fiber a Rubber?

APPROXIMATELY 125 members and guests of the Rhode Island Rubber Group attended a dinner-meeting on April 8 at the Crown Hotel, Providence. Guest speaker at the meeting was J. H. Dillon, director of research of the Textile Research Institute and the Textile Foundation, who discussed "When Is a Fiber a Rubber, and *Vice Versa?*"

After summarizing the objectives and program of the textile organizations he represents, Dr. Dillon pointed out that there is really no such thing as a natural rubber or natural fiber since these materials serve a function in nature quite different from that to which man has put them. After a general discussion of the characteristics of high polymers, the speaker took up rubbers and fibers as classes of high polymers. Some fibers, such as natural cellulose, possess very strong intermolecular binding forces which hold the rigid molecular chains together so that great strength but low extensibility exists in the axial direction. On the other hand, fibers such as wool and nylon possess definite rubbery characteristics produced by weaker bonds between the chains, bulky side-groups which hold the chains apart, and natural waviness in the chain structures. Although wool gives a stress-strain curve very similar to that of rubber, its elasticity appears to be of the "energy type"; whereas rubber has an "entropy elasticity." There are gaps in these data which may cause future modification of these conclusions, the speaker pointed out. The concluding portion of Dr. Dillon's talk was devoted to modifications which can be made in fibers to control their degree of rubberiness. For example, rigid cellulosic fibers can be swollen to permit the introduction of cross-links and bulky side-groups and thus induce greater extensibility.

The assemblage was entertained during dinner by songs rendered by "The Smoothies," a barber-shop quartet. The group's next meeting will be a golf outing to take place on June 24 at the Pawtucket Golf Club, Pawtucket.

A.I.C. Anniversary Meeting

THE silver anniversary of the American Institute of Chemists will be commemorated at a meeting on May 7 at the Waldorf-Astoria Hotel, New York, N. Y. The afternoon program will feature an address by Foster D. Snell, retiring president, followed by a panel of speakers on the subject, "The Professional Activities of Other Societies." Speakers include Charles C. Wilson, on the American Institute of Electrical Engineers; W. A. Mosher on the American Chemical Society; E. Lawrence Chandler, on the American Society of Civil Engineers; and W. T. Nichols, on the American Institute of Chemical Engineers. The A.I.C. will then hold its annual meeting and election.

The evening program will feature a joint meeting and dinner with the New York Section, American Chemical Society, and the presentation of the Institute's gold medal to Charles A. Thomas, executive vice president and technical director of Monsanto Chemical Co., and president of the A. C. S. Francis J. Curtis, Monsanto vice president, will speak on "The Career of the Medalist," and Dr. Snell will make the presentation of the medal.

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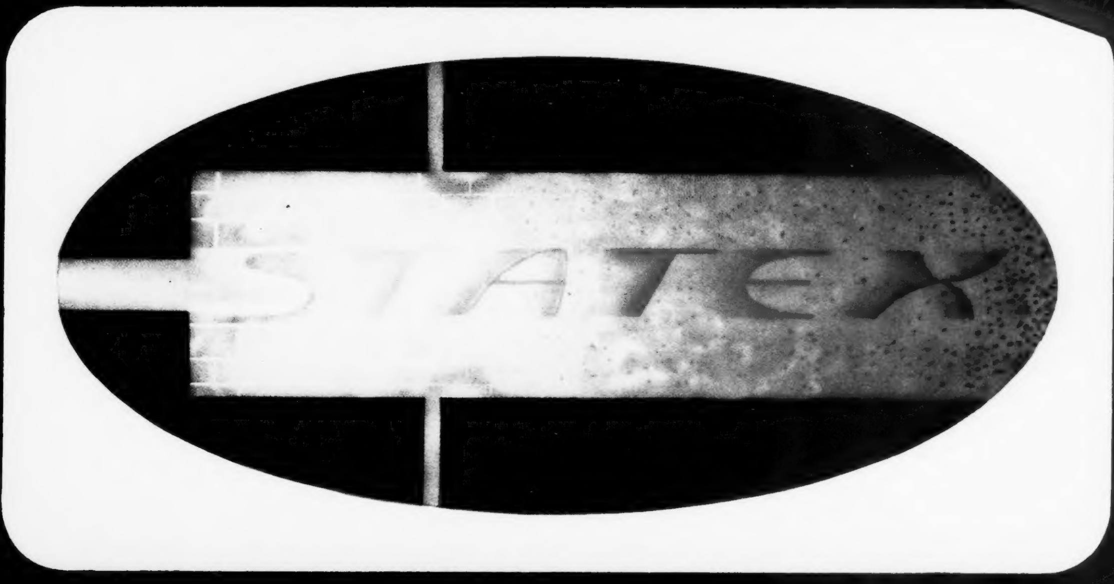

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Additional Experimental GR-S Polymers and Latices; Other Announcements Received from ORR

X-Number Designation	Manufacturing Plant	Date of Authorization	Polymer Description	Special Characteristics
X-439-GR-S	Firestone, Lake Charles	4/2/48	Standard GR-S made in Lake Charles plant equipment (pelletizer and one pass drier).	For April production.
X-440-GR-S		Cancelled		
X-444-GR-S	Goodyear, Houston	3/11/48	Similar to Standard GR-S except for stabilization with 1.5% R-2019 G, a non-staining-type antioxidant.	A non-staining and non-discoloring type of GR-S being prepared for preliminary evaluation. Similar to X-385-GR-S. Scheduled for March production.
X-445-GR-S-AC	U. S. Rubber, Naugatuck	3/18/48	GR-S-SP latex coagulated after dilution with dilute aluminum sulfate solution and stabilized with 1.5% of UBUB.	This coagulation expected to result in very low mechanical water absorption properties. Scheduled for March production.
X-446-GR-S Latex	U. S. Rubber, Naugatuck	3/9/48	A GR-S latex having a 53-47 butadiene-styrene charge ratio, emulsified with potassium rosin soap, and carried to high conversion and to approximately 48% solids.	An improved X-409-GR-S latex formulation being prepared for paper saturation, rug backing, etc. Scheduled for March production. Specification limits: total solids, 47.0-49.9%; residual styrene, 0.10% maximum on total latex; and pH, 9.5-11.5.
X-447-GR-S	General, Baytown	Authorization expected in near future.	GR-S latex black masterbatch containing 50 parts Kosmos 60 per 100 parts 37± 4 Mooney GR-S.	
X-448-GR-S	U. S. Rubber, Borger	3/31/48	GR-S-40-AC shortstopped with hydroquinone.	Scheduled for April production. The present shortstopper being used in GR-S-40-AC is causing excessive corrosion in plant equipment.
X-449-GR-S	Firestone, Lake Charles	3/19/48	Lower viscosity (40-50 Mooney) GR-S-AC stabilized with 1.5% HAC, a non-staining-type antioxidant.	A non-staining and non-discoloring type of GR-S being prepared for preliminary evaluation and comparison with X-397-GR-S-AC. Scheduled for March production.
X-450-GR-S Latex	Firestone, Akron	3/31/48	Same as GR-S Type II Latex except that the Mooney viscosity of the contained polymer to be 32-42.	Scheduled for April production. Specification limits: ph, 8.5-9.25; total solids, 26-28%; and residual styrene, 0.50% max.
X-451-GR-S Latex	U. S. Rubber, Naugatuck	3/31/48	A 70 butadiene-30 styrene charge ratio latex with rosin soap emulsification.	High solids latex similar to Type VII (formerly X-370 GR-S latex). Scheduled for April production. Specification limits: pH, 9-10.5; total solids, 60-63%; and residual styrene, 0.10% maximum.

ADDITIONS to the list of experimental GR-S dry polymers and GR-S latices, available for distribution to rubber goods manufacturers under the conditions outlined in our November, 1945 issue, page 237, appear in the accompanying table.

Normally, experimental polymers will be produced only at the request of the consumers, and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside, if possible, for distribution to other interested companies for their evaluation. The 20 bales, when available, will be distributed in quantities of one bale or two bales upon request to the Sales Division of Rubber Reserve, or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received.

Three experimental GR-S latices have recently been promoted to the GR-S numbered category, as follows: X-359 GR-S latex has become GR-S Latex Type VI, X-370 GR-S latex has become GR-S Latex Type VII, and X-270 GR-S latex has become GR-S Latex Type VIII.

Recently there has been an indication of some doubt in consumers' minds as to which GR-S polymers are commercially available. Since at one time reauthorizations were printed along with the original authorizations, it is felt that it might be of assistance to the consumers if the GR-S polymers made each month were again listed, but without description. The experimental and numbered GR-S polymers and latices produced during March follow: Experimental GR-S polymers—X-181-SP, X-278-SP, X-385, X-392-SP, X-393-SP, X-396, X-407, X-413, X-415, X-416, X-419, X-420, X-421, X-422, X-427, X-430, X-433, X-434, X-435, X-442, X-443, X-444, X-445, and X-449; Numbered GR-S polymers—GR-S, GR-S-AC, GR-S-SP, GR-S-10, GR-S-10-AC, GR-S-12-AC, GR-S-20, GR-S-20-AC, GR-S-21, GR-S-25, GR-S-40-AC, GR-S-45-AC, GR-S-50, GR-S-60, GR-S-60-SP, GR-S-65, GR-S-65-SP, GR-S Black-1, and GR-S Black-2; and GR-S latices—Types II, III, IV, V, VI (formerly X-359), VII (formerly X-370), and VIII (formerly X-270), X-367, X-381, and X-429.

Color Dynamics in Industry

THE use of color dynamics in industry was the subject of the spring meeting of the Akron Rubber Group on April 16 at the Mayflower Hotel, Akron, O. Principal speaker was Joseph C. Thompson, Jr., assistant general paint manager of Pittsburgh Plate Glass Co., who discussed "Color Dynamics and Its Application to Industry." Philip Wiegand, paint technician of the same company, spoke briefly on "Industrial Finishes and Finishing," to start the program. The speakers were introduced by A. E. Boss, manager of pigment sales for Columbia Chemical Division of Pittsburgh Plate Glass Co. and a 20-year member of the Akron Rubber Group.

Mr. Wiegand described the new resins, pigments, and vehicles which have come into use in the paint industry within the past few years and also told about new methods of surface preparation and application of finishes. Of special interest to the assemblage were the descriptions of electrostatic deposition of paint and the use of finishes which heated prior to application.

Mr. Thompson began his talk with a non-technical discussion of the physics of light and color, the effect that light vibrations have on the eye nerves, and the resultant physiological and psychological reactions. The speaker explained the principles of color complements and contrasts, juxtaposition of colors, legibility, and camouflage, using charts as illustrations with which the audience could test themselves. Using a large picture of an average plant having white walls and machinery painted gray, Mr. Thompson took his listeners through the steps involved in the application of color dynamics. When he had finished, the factory had become entirely transformed; walls were finished in morale building colors, the major portion of each machine was finished in a color which took it out of the worker's direct line of vision, but which emphasized working and dangerous parts, ceilings and other overhead equipment appeared to be lifted and no longer bearing down on the worker, and safety aisles and mobile equipment were finished in highly visible, alerting colors. According to the speaker, proper analysis of factory painting problems and proper application of color dynamics will result in better labor relations, increased production, and lower costs.

The business session of the meeting consisted of the announcement of the Group's new officers for the 1948-1949 season, an outline of plans for the annual summer outing, and a brief talk by Harry Outcault, St. Joseph Lead Co., retiring chairman of the Division of Rubber Chemistry, A. C. S. The newly elected officers of the Akron Group follow: chairman, Henry Palmer, consultant; vice chairman, C. A. Ritchie, B. F. Goodrich Co.; and secretary, E. L. Stangor, E. I. du Pont de Nemours & Co., Inc.

The Group's summer outing, to be held on June 18, will be under the general chairmanship of David Anderson, Godfrey L. Cabot, Inc.

Craver Discusses Plasticizers

A TALK on "Plasticizers," by J. Kenneth Craver, Monsanto Chemical Co., featured a meeting of the Northern California Rubber Group on March 25 at Angelo's Restaurant, Oakland, attended by 50 members and guests. Mr. Craver discussed the three types of plasticization in common use: heat, solvents, and plasticizers. Of these types the last two are similar in that they are usually very compatible with the material to be plasticized, and in some cases the plasticizer may be considered a very high solvent. Plasticization also involves consideration of the material to be plasticized because the presence of groups which produce a spring-like chain structure in the polymer is more or less essential. For example, polyvinyl chloride has such a structure and can be plasticized to almost any degree and give a rubber-like product. On the other hand styrene can be plasticized to a very small degree, and once the limit is reached, the product becomes a sticky mass.

The effectiveness of a plasticizer for low-temperature service comes from its ability to enter into the spaces between the "springs" of the polymer, push these springs apart, and not be ejected when the springs contract. To date it has been found that products containing a reasonably heavy fat molecule, such as dioctyl phthalate, are best for this purpose. It has also been noted that those plasticizers best suited for low-temperature service are generally the most easily extracted. This condition is believed due to the fact that in order to maintain flexibility the plasticizer must be self-lubricating and able to move about readily in the polymer. A gap left by extraction of the plasticizer would therefore be refilled by movement of the plasticizer and be again extracted. Thousands of new plasticizers have been prepared, Mr. Craver said, but only a small percentage has ever reached the market for one reason or another. An important factor is cost, which cannot very well be more than 40¢ a pound.

At the meeting a door prize donated by Fritz S. Rostler, Golden Bear Oil Co., was won by D. C. Maddy, Harwick Standard Chemical Co.

Clays Topic of April Meeting

Thirty-eight members and guests attended the April 29 meeting of the Northern California Group at the Claremont Hotel, Berkeley. Guest speaker was L. F. Gongwer, manager, development department, J. M. Huber Corp.'s Borger, Tex., plant, who discussed "Clays for Rubber."

Kaolin, or China clay, is the simplest form of clay and has a low ratio of alumina to silica; the complicated clays, such as bentonite, have higher ratios. These latter clays become sticky in water; while the simple clays remain dry. Clays are also characterized as either hard or soft on the basis of particle size, and the hard clays have a smaller particle size. The particle shape, that of a hexagonal plate, is the same for both hard and soft clays. Hard clays stiffen both uncured and cured rubber stocks more than do soft clays and give higher tensile strength, abrasion resistance, and tear strength. Soft clays, however, have the advantages of being usable in higher loadings, having lighter color, giving faster extrusion of highly loaded stocks, and giving stocks with higher resilience and lower permanent set than do hard clays. Water washed clays are generally used for high-speed extrusion, as in wire insulation or for complicated shapes, because the washing operation removes the mica which causes build-up on the die. Good clays, both hard and soft, show up to 3½% residue on a 325-mesh screen, Mr. Gongwer said. The speaker also described a new method of determining grit which uses a peptized slurry of clay prepared in a malted milk shaker. Grit in clay is particularly undesirable in the manufacture of heels and soles since it dulls the knives used for trimming the molded parts.

At the business session Robert R. James, Rubber Laboratory, Mare Island Naval Shipyard, reported on arrangements being made for attendance at the Los Angeles meeting, July 22 and 23, of the Division of Rubber Chemistry, A. C. S. Grover Ramsey, Goodyear Rubber Co., Herman Jordan, E. I. du Pont de Nemours & Co., Inc., Mr. James, and Arthur E. Barrett, Mare Island Naval Shipyard, were nominated as candidates for the office of Group representative on the Rubber Division directorate.

"Doc" Kirby, L. H. Butcher Co., reported on current events, including the formation of a new rubber company, Sacomo Mfg. Co., in San Francisco, which has purchased the building and equipment of the defunct Plant Rubber & Asbestos Co. Dan Coyne is president, and Vic Sagues is secretary-treasurer of the new concern.

Entertainment at the April 29 meeting was provided by the Group's "renown" quartette: W. D. Good, American Rubber Mfg. Co.; Fred W. Swain, Pioneer Rubber Mills; Russ D. Kettering, Oliver Tire & Rubber Co.; and "Mac" MacLaughlin.

The Group's next meeting is set for May 27 at the Women's City Club of Oakland.

CALENDAR

Apr. 15-June 30. America's Security Loan Campaign. (Buy U. S. Savings Bonds Now!)

May 3-7. Textile Machinery Show. 71st Regiment Armory, New York, N. Y.

May 4. Canadian SPI. Royal York Hotel, Toronto, Ont., Canada.

May 6. New Orleans Section, SPE. Hotel New Orleans, New Orleans, La.

May 8-15. National Golf Week.

May 11. Washington Rubber Group. Nat'l Academy of Sciences Bldg., Washington, D. C.

May 13. Quebec Rubber & Plastics Group. Ritz Carlton Hotel, Montreal, P. Q., Canada.

May 14. Detroit Section, SPE. Horace H. Rackham Memorial Bldg., Detroit, Mich.

May 15. Southern Ohio Rubber Group. Spring Outing and Golf Tournament. Edelweiss Park, Dayton, O.

May 19. South Texas Section, SPE. Ben Milam Hotel, Houston, Tex.

May 20-21. Society of the Plastics Industry. Annual Meeting. Atlantic City, N. J.

May 21. Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.

May 27. Northern California Rubber Group.

June 1. Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.

June 6-11. SAE. Summer Meeting. French Lick Springs Hotel, French Lick, Ind.

June 7-10. Chemical Institute of Canada. Annual Conference. Mount Royal Hotel, Montreal, P. Q., Canada.

June 9. Rubber Division, C.I.C. Windsor Hotel, Montreal.

June 7-12. International Textile Industries Exposition, Grand Central Palace, New York, N. Y.

June 18. Akron Rubber Group. Summer Outing. Lake Forest Country Club, Hudson, O.

June 18. Boston Rubber Group. Annual Outing. Woodland Golf Club, Newton, Mass.

June 21-26. National Swim Week.

June 21-26. A.S.T.M. Annual Meeting and Eighth Exhibit of Testing Apparatus & Related Equipment. Detroit, Mich.

June 24. Northern California Rubber Group.

June 24. Rhode Island Rubber Club. Summer Outing. Pawtucket Golf Club, Pawtucket, R. I.

June 25. Detroit Rubber & Plastics Group, Inc. Summer Outing. Forest Lake Country Club.

June 26. New York Rubber Group. Annual Outing. Doerr's Grove, Short Hills, N. J.

June 29-30. SPI Low-Pressure Industries Division. Seminar. Statler Hotel, Washington, D. C.

July 17. Chicago Rubber Group. Annual Golf Outing.

Aug. 23-Sept. 19. City of New York. Golden Anniversary Exposition. Grand Central Palace, New York, N. Y.

Aug. 24. New York Rubber Group. Annual Golf Tournament. Winged Foot Golf Club. Mamaroneck, N. Y.

Chemical Market Research

REPRESENTATIVES of 120 American and Canadian chemical companies met at the Copley-Plaza Hotel, Boston, Mass., on April 8 for a joint session on chemical market research sponsored by the Chemical Market Research Association and Massachusetts Institute of Technology. Speakers at the meeting, consisting of morning, luncheon, afternoon, and dinner sessions, included Georges F. Doriot, Harvard University; Alex Bavelas, Ross M. Cunningham, Gerald B. Tallman, and Horace S. Ford, all of M.I.T.; Richard B. Schneider, Arthur D. Little, Inc.; Lauren B. Hitchcock, Quaker Oats Co.; and Robert F. Elder, Lever Brothers. Bradley Dewey, president of Dewey & Almy Chemical Co., introduced Professor Doriot who spoke on "Is American Business Worrying about the Right Problems?"

Plastic Developments for Paper

(*Continued from page 236*)

adjustments in most or all of the others to obtain good adhesion. Desirable characteristics of the thermoplastic for smooth heat-sealing operations are relatively high blocking resistance point, relatively low complete activation point, relatively wide effective temperature range, and uniformity of coating within runs and between runs when it is necessary to stop production.

RUBBER WORLD

NEWS of the MONTH

Highlights—

The "Rubber Act of 1948," to be in effect from April 1, 1948, until July 1, 1950, has established the policy of the United States on rubber for that period of time. Comment was generally favorable with regard to the new law. Production in the tire and sole and heel branches of the industry continued at a lower level than during last year. The introduction of a second- and third-line of tires by several companies may raise the tire production rate to a higher level. Minor labor disputes plagued the rubber goods industry in the Akron area.

"Rubber Act of 1948" Becomes Law; Second- and Third-Line Tires Announced

A compromise rubber bill, to be known as the "Rubber Act of 1948," was passed by Congress and signed by the President on March 31. The bill established the policy of the United States on rubber until July 1, 1950. As expected, the production and use of about one-third of the total new rubber to be used in this country for the next two years is to be synthetic rubber. Consumption at present is even higher than the required minimum. The matters of plant disposal and development work by private companies are to be worked out to permit independent work on synthetic rubber within about one year, it is expected.

For the first time since before the late war, the production of a second- and a third-line of passenger-car tires is under way in several companies, including the Big Four.

Another meeting of the International Rubber Study Group began on April 26 in Washington, D. C.

The "Rubber Act of 1948"

The months of work by the Congressional subcommittees on rubber, the hearings participated in by representatives of the rubber goods industry, associated industries, the departments and bureaus of the executive branch of the government, and, in fact, almost anyone with an interest in rubber policy, were culminated on March 31, with passage by the Congress of Public Law 469—80th Congress, to be known as the "Rubber Act of 1948," and approval by President Truman on the same day.

Highlights of the new law were that the statement of principle, as written in the Senate Bill, were carried over practically unchanged, the annual production of 200,000 long tons of general-purpose synthetic rubber and about 22,000 long tons of special-purpose synthetic rubber was ordered, mandatory use of the abovementioned synthetic rubber was not limited to transportation items, a termination date of June 30, 1950, was included, *but,* no provision for a new pricing formula for synthetic rubber was in the new law.

Since this is the law of the land on rubber from now until July 1, 1950, we feel that a complete transcript of the law should be recorded in India Rubber World and it therefore is given herewith:

Public Law 469—80th Congress
(Chapter 166—2d Session)
(H. R. 5314)

An Act

To strengthen national security and the common defense by providing for the maintenance of an adequate domestic rubber-producing industry, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Rubber Act of 1948."

Declaration of Policy

Sec. 2. It is the policy of the United States that there shall be maintained at all times in the interest of national security and common defense, in addition to stockpiles of natural rubber which are to be acquired, rotated, and retained pursuant to the Strategic and Critical Materials Stock Piling Act (Public Law 520, Seventy-ninth Congress, approved July 23, 1946), a technologically advanced and rapidly expandible rubber-producing industry in the United States of sufficient productive capacity to assure the availability in times of national emergency of adequate supplies of synthetic rubber to meet the essential civilian, military, and naval needs of the country. It is further declared to be the policy of the Congress that the security interests of the United States can and will be best served by the development within the United States of a free, competitive synthetic rubber industry. In order to strengthen national security through a sound industry it is essential that Government ownership of production facilities, Government production of synthetic rubber, and patent pooling be ended and terminated whenever consistent with national security, as provided in this act.

Authority to Exercise Certain Controls over Natural Rubber and Synthetic Rubber and Products Containing Natural and Synthetic Rubber

Sec. 3. To effectuate the policies set forth in section 2 of this Act, the President is authorized to exercise allocation, specification, and inventory controls of natural and synthetic rubber, and specification controls of products containing natural and synthetic rubber, notwithstanding any changes in the supply or estimated supply of natural rubber or synthetic rubber; and he shall exercise such controls by issuing such regulations as are required to insure (a) the consumption in the United States of general-purpose synthetic rubber in a specified percentage of the combined total estimated annual consumption of natural rubber and general-purpose synthetic rubber consumed within the United States, and (b) the consumption in the United States of any or all types of special-purpose synthetic rubber in specified percentages of the combined total estimated annual consumption of natural rubber, general-purpose synthetic rubber, and special-purpose synthetic rubber consumed within the United States. Such percentages shall be established so as to assure the production and consumption of general-purpose synthetic rubber and special-purpose synthetic rubber in quantities determined by the President to be necessary to carry out the policy of section 2 of this Act, and the provisions of Public Law 520, Seventy-ninth Congress, approved July 23, 1946: *Provided,* That the minimum percentages established by the President shall result in a total annual tonnage consumption of synthetic rubber of at least the amounts specified in section 5 (d) of this Act, and that any mandatory consumption in excess of the quantities specified in section 5 (d) of this Act shall not be more than is deemed by the President to be necessary in the interest of national security and the common defense.

Importation and Exportation

Sec. 4. (a) The President may impose such import restrictions on finished and semifinished rubber products as he deems necessary to assure equality with like or similar products produced within the United States in accordance with regulations issued under this Act. (b) The President may exempt from the regulations issued under this Act finished and semifinished rubber products manufactured in the United States exclusively for export outside the United States.

Domestic Rubber-Producing Capacity

Sec. 5. (a) There shall be maintained at all times within the United States rubber-producing facilities having a rated production capacity of not less than six hundred thousand long tons per annum of general-purpose synthetic rubber and not less than sixty-five thousand long tons per annum of special-purpose synthetic rubber. (b) Of the sixty-five-thousand-long-ton rated production capacity for special-purpose synthetic rubber, specified in section 5 (a) of this Act, at least forty-five thousand long tons shall be of a type suitable for use in pneumatic inner tubes. (c) The synthetic rubber used to satisfy the mandatory consumption provided in section 3 of this Act shall be produced by the Government or for the Government account, or purchased from others for resale by the Government or for the Government account. (d) Facilities in operation by the Government or private persons shall produce annually not less than one-third of the rated production capacities specified in section 5 (a) and (b) of this Act. (e) The facilities to be maintained in operation by the Government and those to be maintained in adequate stand-by condition shall be determined from time to time by the President. (f) At least one facility for making butadiene from alcohol shall be maintained in operation or in adequate stand-by condition.

Research and Development

Sec. 6. (a) To effectuate the policies set forth in section 2 of this Act with

respect to a technologically advanced domestic rubber-producing industry, continuous and extensive research by private parties and the Government is essential. The Government is hereby authorized to undertake research in rubber and allied fields and the powers, functions, duties, and authority of the Government to undertake research and development in rubber and allied fields shall be exercised and performed by such departments, agencies, officers, Government corporations, or instrumentalities of the United States as the President may designate, whether or not existing at the date of enactment of this Act. (b) The cost of undertaking and maintaining the research and development authorized in section 6 (a) of this Act may be paid from such sums as the Congress, from time to time, may appropriate to carry out the provisions of this Act.

Operation of Rubber-Producing Facilities by the United States Government

SEC. 7. (a) The powers, functions, duties, and authority to produce and sell synthetic rubber conferred in section 7 (b) of this Act shall be exercised and performed by such department, agency, officer, Government corporation, or instrumentality of the United States as the President may designate, whether or not existing at the date of enactment of this Act. (b) The department, agency, officer, Government corporation, or instrumentality of the United States designated by the President pursuant to section (7) (a) of this Act shall have the powers, functions, duties, and authority to produce and sell synthetic rubber, including the component materials thereof, in amounts sufficient to assure the production of synthetic rubber as required by the President in section 3 of this Act: *Provided*, That so far as practicable the President shall authorize such production of synthetic rubber, including the component materials thereof. (c) The aforesaid powers, functions, duties, and authority to produce and sell include all power and authority in such department, agency, officer, Government corporation, or instrumentality of the United States to do all things necessary and proper in connection with and related to such production and sale, including but not limited to the power and authority to make repairs, replacements, alterations, improvements, or betterments to the rubber-producing facilities owned by the Government or in connection with the operation thereof and to make capital expenditures as may be necessary for the efficient and proper operation and maintenance of the rubber-producing facilities owned by the Government and performance of said powers, functions, duties, and authority. (d) Notwithstanding the provisions of this or any other Act, the aforesaid powers, functions, duties, and authority to produce and sell include the power and authority in such department, agency, officer, Government corporation, or instrumentality of the United States to (1) lease for operation for Government account all or any part of the Government-owned rubber-producing facilities in connection with the performance of said powers, functions, duties, and authority to produce and sell; (2) lease, for a period not extending beyond the termination date of this Act, Government-owned rubber-producing facilities for private purposes if such lease contains adequate provisions for the recapture thereof for the purposes set forth in section 7 (b) of this Act and if such lease provides that any synthetic rubber or component material as may be produced by the leased facilities shall not be used to satisfy mandatory requirements established by section 3; (3) grant permanent easements or licenses for private purposes in, on, or over land comprising part of the Government-owned rubber-producing facilities if such grant provides that such easement or license shall not interfere with the use at any time of the rubber-producing facilities involved; and (4) sell or otherwise dispose of obsolete or other property not necessary for the production of the rated capacity of the particular plant to which such property is charged.

Stand-By Facilities

SEC. 8. (a) To effectuate further the policies set forth in section 2 of this Act, the President is authorized to place in adequate stand-by condition such rubber-producing facilities as he shall determine necessary to maintain the continued existence of rubber-producing facilities capable of producing the tonnage of synthetic rubber required by section 5 (a) of this Act. (b) Rubber-producing facilities placed in stand-by condition by the President pursuant to section 8 (a) of this Act may be maintained by such department, agency, officer, Government corporation, or instrumentality of the United States, whether or not existing on the date of enactment of this Act, as the President may designate: *Provided*, That nothing contained in section 8 (b) of this Act shall preclude such department, agency, officer, Government corporation, or instrumentality of the United States from entering into contracts with private persons for the maintenance of stand-by facilities: *Provided further*, That the cost of placing facilities in stand-by condition, maintaining such facilities in adequate stand-by condition, and, when necessary, reactivating such facilities, may be paid from such sums as the Congress, from time to time, may appropriate to carry out the provisions of this Act.

Disposing of Government-Owned Rubber-Producing Facilities

SEC. 9. (a) The department, agency, officer, Government corporation, or instrumentality of the United States designated by the President pursuant to section 7 (a) of this Act shall undertake immediate study, conducting such hearings as may be necessary, in order to determine and formulate a program for disposal to private industry by sale or lease of the Government-owned rubber-producing facilities other than those authorized to be disposed of pursuant to section 9 (b) of this Act. A report with respect to the development of such a disposal program shall be made to the President and to Congress not later than April 1, 1949. On or before January 15, 1950, the President, after consultation with the National Security Resources Board, shall recommend to the Congress legislation with respect to the disposal of the Government-owned rubber-producing facilities other than those authorized to be sold, leased, or otherwise disposed of under the provisions of section 9 (b) of this Act, together with such other recommendations as he deems desirable and appropriate: *Provided*, That the Government shall maintain the ownership of a rated rubber-producing capacity of six hundred thousand long tons of general-purpose rubber and a rated rubber-producing capacity of sixty-five thousand long tons of special-purpose rubber until a program is formulated and adopted for the sale or lease of such facilities as provided in this section. (b) Notwithstanding the provisions of this or any other Act, the department, agency, officer, Government corporation, or instrumentality of the United States designated by the President pursuant to section 7 (a) of this Act may, after consultation with the National Security Resources Board, sell, lease, or otherwise dispose of to private persons any rubber-producing facility, including such facilities as have been declared surplus pursuant to the Surplus Property Act of 1944, as amended, not required to fulfill the capacity set forth in section 5 (a) of this Act upon such terms and conditions as it may determine providing that such sale or lease shall be on the condition that any synthetic rubber or component materials produced in such facility shall not be used to satisfy the mandatory requirements established by section 3 of this Act.

Administration

SEC. 10. (a) The President may issue such rules and regulations as he deems necessary and appropriate to carry out the provisions of this Act. (b) The President may exercise any or all of the powers, authority, and discretion conferred upon him by this Act, including but not limited to the powers and authority conferred in section 12 of this Act, through such departments, agencies, officers, Government corporations, or instrumentalities of the United States, whether or not existing at the date of the enactment of this Act, as he may direct. (c) The President, insofar as practical, shall consolidate all of the powers, functions, and authority contained in this Act in one department, agency, officer, Government corporation, or instrumentality of the United States, whether or not existing at the date of enactment of this Act. The President is authorized to cause a corporation to be organized for the purpose of producing and selling synthetic rubber. Any such corporation so organized shall be authorized, subject to the Government Corporation Control Act and to pertinent provisions of law affecting Government corporations, to sue and be sued, to acquire, hold, and dispose of property, to use its revenues, to determine the character of and necessity for its obligations and expenditures and the manner in which they shall be incurred, allowed and paid, and to exercise such other powers as may be necessary or appropriate to carry out the purposes of the corporation. The Secretary of the Treasury is authorized, out of appropriations made for that purpose to subscribe to the capital stock of such corporation. (d) The President may transfer to the departments, agencies, officers, Government corporations, or instrumentalities of the United States, or to any of them, which he directs to exercise the powers, authority, and discretion conferred upon him by this Act, such rubber-producing facilities, personnel, property, and records relating to such powers, authority, and discretion, as he deems necessary; and he may so transfer all appropriations or other funds available for carrying out such powers, authority, and discretion. (e) In addition to the reports required by section 9 (a) of this Act, each department, agency, officer, Government corporation, or instrumentality of the United States to whom the President may delegate any powers, authority, and discretion conferred by this Act shall

make an annual report to the President and to the Congress of operations under this Act.

Patent Pooling and Use of Technical Information

SEC. 11. (a) To effectuate further the policies of this Act, the President is authorized and directed to take such action as may be appropriate with respect to patent pooling, patent licensing and exchange of information agreements entered into with the Government as a part of the wartime synthetic rubber program and, insofar as practicable and consistent with the purposes of this Act, to effectuate immediate cessation of further accumulation of technical information or rights to patents under the agreement dated December 19, 1941, as supplemented June 12, 1942, between the Government and others. (b) Any department, agency, officer, Government corporation, or instrumentality of the United States as the President may designate to perform the powers, functions, duties, and authority referred to in section 7 (b) of this Act shall be entitled to the benefits of the Act of June 25, 1910 (36 Stat. 851), as amended July 1, 1918 (40 Stat. 705), or any similar Act.

Information, Reports, Subpenas, Witnesses, and Testimony

SEC. 12. (a) The President shall be entitled to obtain such information from, require such reports and the keeping of such records by, make such inspection of the books, records, and other writings, premises, or property of, any person and make such investigations, as may be necessary or appropriate, in his discretion, to the enforcement or administration of the provisions of this Act. (b) For the purpose of obtaining any information, verifying any report required, or making any investigation pursuant to section 12 (a) of this Act, the President may administer oaths and affirmations, and may require by subpena or otherwise, the attendance and testimony of witnesses and the production of any books or records of any other documentary or physical evidence which may be relevant to the inquiry. Such attendance and testimony of witnesses and the production of such books, records, or other documentary or physical evidence may be required at any designated place from any State, Territory, or other place subject to the jurisdiction of the United States: *Provided*, That the production of a person's books, records, or other documentary evidence shall not be required at any place other than the place where such person resides or transacts business, if, prior to the return date specified in the subpena issued with respect thereto, such person furnishes the President with a true copy of such books, records, or other documentary evidence (certified by such person under oath to be a true and correct copy) or enters into a stipulation with the President as to the information contained in such books, records, or other documentary evidence. Witnesses shall be paid the same fees and mileage that are paid witnesses in the courts of the United States. No person shall be excused from attending and testifying or from producing any books, records, or other documentary evidence or certified copies thereof, or physical evidence, in obedience to any such subpena, or in any action or proceeding which may be instituted under this Act on the ground that the testimony or evidence, documentary or otherwise, required of him may tend to incriminate him or subject him to a penalty or forfeiture; but no individual shall be subject to prosecution and punishment, or to any penalty or forfeiture, for or on account of any transaction, matter, or thing concerning which he is compelled to testify or produce evidence, documentary or otherwise, after having claimed his privilege against self-incrimination, except that any such individual so testifying shall not be exempt from prosecution and punishment for perjury committed in so testifying. The President shall not publish or disclose any information obtained under this section which the President deems confidential or with reference to which a request for confidential treatment is made by the person furnishing such information, unless the President determines that the withholding thereof is contrary to the interest of the national defense and security; and anyone violating this provision shall be guilty of a felony and, upon conviction thereof, shall be fined not exceeding $1,000 or be imprisoned not exceeding two years, or both.

Penalties

SEC. 13. Any person who willfully performs any act prohibited, or willfully fails to perform any act required by any provision of this Act or any rule, regulation, or order thereunder, shall upon conviction be fined not more than $10,000 or imprisoned for not more than two years, or both.

Jurisdiction of the United States Courts

SEC. 14. (a) The district courts of the United States, and the United States courts of any Territory or other place subject to the jurisdiction of the United States, shall have jurisdiction of violations of this Act or any rule, regulation, or order or subpena thereunder, and of all civil action under this Act to enforce any liability or duty created by, or to enjoin any violation of this Act or any rule, regulation, order, or subpena thereunder. (b) Any criminal proceeding on account of any such violation may be brought in any district in which any act, failure to act, or transaction constituting the alleged violation occurred. Any such civil action may be brought in any such district or in the district in which the defendant resides or transacts business. Process in such cases, criminal or civil, may be served in any district wherein the defendant resides or transacts business or wherever the defendant may be found; and subpenas for witnesses who are required to attend a court in any district in any such cases may run into any other district. No costs shall be assessed against the United States in any proceeding under this Act.

Exculpatory Clause

SEC. 15. No person shall be held liable for damages or penalties for any default under any contract or order which shall result directly or indirectly from compliance with this Act or any rule, regulation, or order issued thereunder, notwithstanding that any such rule, regulation, or order shall thereafter be declared by judicial or other competent authority to be invalid.

Exemption from Administrative Procedure Act

SEC. 16. Functions exercised under this Act shall be excluded from the operation of the Administrative Procedure Act except as to the requirements of sections 3 and 10 thereof.

Separability

SEC. 17. If any provision of this Act or the application thereof to any person or circumstance is held invalid, the validity of the remainder of the Act and of the application of such provision to other persons and circumstances shall not be affected thereby.

Definitions

SEC. 18. For the purposes of this Act —(a) The term "natural rubber" means all forms and types of tree, vine, or shrub rubber, including guayule and natural rubber latex, but excluding reclaimed natural rubber; (b) The term "synthetic rubber" means any product of chemical synthesis similar in general properties and applications to natural rubber, and specifically capable of vulcanization, produced in the United States, not including reclaimed synthetic rubber; (c) The term "general-purpose synthetic rubber" means a synthetic rubber of the butadiene-styrene type generally suitable for use in the manufacture of transportation items such as tires or camel-back as determined from time to time by the President; (d) The term "special-purpose synthetic rubber" means a synthetic rubber of the types now known as butyl, neoprene, or N-types (butadiene-acrylonitrile types) as well as any synthetic rubber of similar or improved quality applicable to similar uses, as determined from time to time by the President; (e) The term "rubber-producing facilities" means facilities, in whole or in part, for the manufacture of synthetic rubber, and the component materials thereof, including, but not limited to, buildings and land in which or on which such facilities may be located and all machinery and utilities associated therewith; (f) The term "rated production capacity" means the actual productive capacity assigned to any rubber-producing facilities at time of authorization of construction or as thereafter amended in authorizations of additional construction or alterations thereto and used in published reports and in the records of the Office of Rubber Reserve, Reconstruction Finance Corporation, or successor agency, or privately owned plants, determined by the President based upon operating experience and records as determined from time to time by the President; (g) The term "component materials" means the material, raw, semi-finished, and finished, necessary for the manufacture of synthetic rubber; (h) The term "stand-by condition" means the condition in which rubber-producing facilities, in whole or in part, are placed when determined to be not needed for current operations, but are maintained so as to be readily available for the production of synthetic rubber or component materials; (i) The term "person" means any individual, firm, copartnership, business trust, corporation, or any organized group of persons whether incorporated or not, and except for the provisions of section 13 any Government department, agency, officer, corporation, or instrumentality of the United States; and (j) The term "United States" includes the several States, the District of Columbia, the Territories of Alaska and Hawaii, and Puerto Rico.

Authorization for Appropriations

SEC. 19. (a) There are hereby authorized to be appropriated such sums as may be necessary and appropriate to carry out the provisions and purposes of this Act. (b) Until such time as appropriations herein authorized are made, any

corporation, or instrumentality of the United States may, in order to carry out its functions, powers, and duties under this Act, continue to incur obligations and make expenditures in accordance with laws in effect on March 31, 1948.

Effective Date

SEC. 20. This Act shall become effective on April 1, 1948, and shall remain in effect until June 30, 1950.

Approved March 31, 1948.

Presidential Executive Order 9942

On April 1, President Truman issued Executive Order 9942 defining the "performance of certain functions under the Rubber Act of 1948" as follows:

TITLE III — THE PRESIDENT

Executive Order 9942

Providing for the Performance of Certain Functions under the Rubber Act of 1948.

By virtue of the authority vested in me by the "Rubber Act of 1948," approved March 31, 1948, and as President of the United States, it is hereby ordered, in the interest of the internal management of the Government, as follows:

1. The Secretary of Commerce shall perform and exercise the functions, duties, powers, authority, and discretion (hereinafter collectively referred to as functions) vested in the President by sections 3, 4, 18 (c) and 18 (d) of the "Rubber Act of 1948."

2. The Reconstruction Finance Corporation shall perform and exercise the functions vested in the President by, or designated in sections 5 (c), 5 (e), 6, 7, 8, 11 (a), and 18 (f) of the "Rubber Act of 1948;" *Provided*, That the provisions of this paragraph which relate to section 6 (a) of the said Act shall not be construed as precluding any other agency of the Government from engaging in research or development authorized by law.

3. The Secretary of Commerce shall in respect of the functions covered by paragraph 1 of this order and related functions under the "Rubber Act of 1948," and Reconstruction Finance Corporation shall in respect of the functions covered by paragraph 2 of this order and related functions under said Act, perform and exercise the functions of the President (including power of subpena) under sections 10 and 12 of the said Act.

4. This order shall be effective April 1, 1948.

HARRY S. TRUMAN

The White House
April 1, 1948
(F.R. Doc. 48-3027; Filed, Apr. 2, 1948; 11:02 A.M.)

Amendment 3 to Rubber Order R-1

The Office of Materials Distribution, also on April 1, issued Amendment 3 to Rubber Order R-1, as follows:

TITLE 32—NATIONAL DEFENSE

Chapter IX—Office of Materials Distribution, Bureau of Foreign and Domestic Commerce, Department of Commerce.

(Rubber Order R-1, as amended Feb. 12, 1948, Amdt. 3)

PART 4600—RUBBER, SYNTHETIC RUBBER AND PRODUCTS THEREOF

Part 4600, Rubber Order R-1, as amended February 12, 1948, is hereby further amended as follows:

1. By changing the first paragraph thereof to read as follows:

The following order is deemed necessary and appropriate to strengthen national security and the common defense by providing for the maintenance of an adequate domestic rubber-producing industry and to carry out the purposes of the Rubber Act of 1948, Public Law 469, 80th Congress, approved March 31, 1948.

Issued this 1st day of April, 1948.

OFFICE OF MATERIALS DISTRIBUTION,
BY RAYMOND S. HOOVER,
Issuance Officer.

Comment on the Rubber Act

First reaction to the "Rubber Act of 1948" was from the tire manufacturers who were reported as declaring that they could "live with it." An Administration official said that it meets national security requirements.

Lockwood's *Rubber Report* for April 15 commented that the Rubber Act was arrived at in the democratic way, after a full and fair hearing for all, and it will not be lightly changed. This legislation is the now united viewpoint of all responsible elements in the United States as to what, in rubber, is necessary for *national security*. No inter-governmental agreement can change it. Any request now for it to be changed, or any attacking of it as "opposed to the principles of free competition" will be received most unfavorably. One does not bargain with national security, and this is the carefully framed United States national security program, it was said.

The probable administrative action that will be taken by the Office of Materials Distribution is also summarized in Lockwood's *Report*. It is suggested that:

1. The new order will specify minimum percentages of synthetic rubber, related to the total new rubber, which must be used rather than the maximum natural which will be permitted. Consumers, of course, will be free to use as much reclaim as they desire.

2. Mandatory usage may be confined, at least initially, to the transportation field.

3. The existing specification in the tire probably need not be materially altered to fit the new pattern. Hence, the new order, for instance, should require somewhat more than two-thirds of the new rubber in a 6:00 x 16 tire to be GR-S.

4. Truck and bus tubes might be made largely from Butyl rubber, and about one-third of the total new rubber in tubes for passenger tires might be Butyl.

5. *All* specification controls on liquid latex may be abolished.

6. Inventory and import controls should remain substantially as at present.

7. Allocation controls (permits) on the purchase of synthetic rubber will be continued.

Also included in Lockwood's *Report* for April 15 was comment on the Rubber Act by J. H. Nesbit, president of U. S. Rubber Reclaiming Co., Inc. and of the Rubber Reclaimers Association. Mr. Nesbit said in part:

"Now that reclaimers know the law, we can give thought to our future, which, I am glad to say, does not appear to be too pessimistic. We are presently reclaiming the blends of GR-S and natural rubber which are found in current scrap collections. The resultant product is strictly high-grade material which is finding ready acceptance. Its processing properties are superior for most uses to those of the alkali-digester natural rubber reclaim which represented the bulk of our production in the past. It has been found that the presence of GR-S in our scrap rubber base makes for, on the whole, a better reclaimed rubber.

"For the few who for special jobs still prefer natural rubber reclaim, it is still available, but the demand for the old-fashioned type is dwindling month by month. Most compounders find they can do a better job with the blends of GR-S and natural rubber, which have a smoothness and easy mixing property never before attained. It is my opinion that as these desirable characteristics become known and appreciated, the modern reclaimed rubber, as now made, will be found the answer to the problem of producing the moderately priced articles which will represent a large share of the demand of the future."

Washington Study Group Meeting

The sixth meeting of the International Rubber Study Group, which is composed of representatives from 15 or 20 of the principal producing and consuming nations, will be held in Washington, D. C., during the week of April 26.

With the rubber policy of the United States for the next two years now established, it is expected that estimates of natural rubber production and consumption may be made with greater accuracy.

Lockwood's *Report* suggests that there would seem to be considerable merit in bringing together, perhaps as a subcommittee of the already formed Study Group Development Committee, the leading technical men concerned to discuss and agree on new and improved methods of preparation of natural rubber which would materially aid the processor on the consuming side and furnish a new or specialized market for the large-scale producer from the other side.

The Study Group, to be effective, must be constructive and specific. Its statistical group is specific, and a technical group could be decidedly constructive, it is concluded.

Rubber Goods Production Trend

The slump in the demand for passenger-car tires, attributed among other things to the satisfaction of the "pent-up" demand resulting from the lack of production during the war years, has produced announcements regarding second- and third-line passenger-car tires by about ten different companies, including all of the Big Four tire manufacturers. These tires, which in the popular sizes will sell from about two to five dollars less than the first-line tires, are expected to be for the motorist who must use his present car for some time yet and does not want to spend the money for the first-line tire. Production of these second- and third-line tires may permit the tire industry to operate more nearly at capacity, which would not be possible under present conditions if first-line tires only were being produced.

In the mechanical goods field the demand for belting continues high, and a backlog of orders of from four to seven months, is reported. Also, postwar expansion and rehabilitation of the steel and chemical industries have resulted in a record output of "rubber bonded to metal" products, it has been stated.

In the sole and heel field, demand is still low, and manufacturers of these rubber goods are hoping for an upturn in the near future.

In all branches of the rubber goods industry it is still too early to see evidence of the effect of the preparedness program and the European Recovery Program on production rates, but it is quite likely that an increase in the demand for many rubber items will result from these recent governmental actions.

According to the regular monthly report on tire production by The Rubber Manufacturers Association, Inc., manufacturers' shipments of passenger-car and truck and bus casings declined 13.7% to 5,106,335 units during February, as com-

pared with 5,919,026 units shipped in January.

Production of passenger-car casings was 5,109,722 in February, against 6,438,955 in January; while truck and bus casing production was 1,275,672 in February, compared with 1,411,967 during January.

Complete statistical data from this RMA report will be found, as usual, in the statistical section of this issue.

The report of the Office of Materials Distribution on consumption, distribution, and stocks of rubber according to type for February (preliminary figures) showed consumption as: natural, 50,927 long tons (including 1,844 long tons, dry weight of latex); GR-S, 27,900 long tons; neoprene, 2,517 long tons; Butyl, 4,241 long tons; and nitrile type, 500 long tons.

Tonnage figures for February for new supply and production were: natural, 54,268 (including 2,400 tons, dry weight of latex); GR-S, 30,284; neoprene, 2,983; Butyl, 5,315; and nitrile type, 443.

Stocks on hand at the end of February were: natural, 148,628 long tons (including 7,241 tons, dry weight of latex); GR-S, 42,782; neoprene, 5,511; Butyl, 14,714; and nitrile type, 2,925.

FTC Data Given by Companies

The Federal Trade Commission announced on April 2 that the "Big Four" rubber companies have complied with its order to supply information on their sales to large-volume customers of tires. The companies have filed the data which is now being studied, it was said.

It now remains to be seen whether the FTC will establish the quantity limits on sales of tires and tubes eligible for discount, in accordance with the authority to set such limits which it has never used in the past.

Labor Relations News

The URWA local 18, at the Akron plant of the Seiberling Rubber Co., met during the latter part of March and during April in an attempt to negotiate a contract to replace the one which expired during January. On April 12 it was announced that an offer by the company of six paid holidays and a liability clause had been rejected by the union. Conferences with the company were resumed.

Two of the Akron plants of the Goodyear Tire & Rubber Co. were closed from April 8 until April 12 when a trucker refused to operate an elevator as part of his duties. The worker was suspended for one week without pay; the other truckers walked out in sympathy, and work at the two plants had to be curtailed. A spokesman for the company said that operation of the elevator was a part of the regular duties of the truckers. The local union succeeded in getting the workers back to their jobs on April 12, pending settlement of the dispute by W. E. Simpkin, impartial umpire for the company and the union.

A strike closed the plant of the Columbia Chemical Division, Pittsburgh Plate Glass Co., in Barberton, O., on April 12. The workers, members of local 13013, District 50, United Mine Workers, rejected a wage increase offered them by the company. The union, which had originally demanded a 30¢-an-hour wage increase and had offered to settle for a 10¢-an-hour increase, turned down the company's offer of a 7½¢-an-hour increase and six paid holidays. The company stated that in contrast to labor difficulties at the Barberton plant, it had enjoyed friendly and strike-free relations since 1946 with all other unions in its 34 other plants.

EASTERN AND SOUTHERN

John A. Britton, Jr.

Britton Enjay President

John A. Britton, Jr., has been made president of Enjay Inc., 15 W. 51st St., New York 19, N. Y., chemical products marketing affiliate of Esso Standard Oil Co., succeeding H. W. Fisher. O. V. Tracy, assistant manager of Esso Standard's chemical products department, has been elected a director of Enjay, succeeding H. G. Burks, Jr.

Mr. Britton became a vice president of Enjay upon its organization in 1947, in charge of sales of synthetic rubbers and Paramins (oil additives). Prior to that time he had been associated with Standard Oil Co. (New Jersey) and affiliated companies for 27 years, largely in the development and sale of additives and synthetic rubbers. He is a member of the rubber groups of New York, Los Angeles, and Philadelphia, The Society of Automotive Engineers, The Oil Trades Association of New York, and the 25-Year Club of the Petroleum Industry.

Joining the research department of Standard Oil Co. of Louisiana at Baton Rouge in 1930, Mr. Tracy pioneered and has been continuously associated with the development of synthetic rubbers, alcohols, additives, and other chemicals and until recently was manufacturing coordinator of such products for Esso Standard Oil Co. He is also a member of the American Chemical Society and the Cornell Club of New York.

H. W. Fisher, general manager of East Coast manufacturing and manager of the chemical products department of Esso Standard Oil Co., will continue as a director of Enjay Co., Inc.

Vice President James G. Park is in direct charge of all operations, including Paramins lubricant and fuel additives under A. Bruce Boehm, and rubbers and resins under Irving E. Lightbown, sales managers, respectively, for these products.

Footwear Exhibition

The Shoe Mfr's Fall Opening was held at the Hotel New Yorker, New York, N. Y., from April 11 to 15. Occupying the fifth to the tenth floors plus Parlors A, B, and C, and the 39th floor, were 460 exhibitors displaying more than 300 different lines of footwear.

The show, opening for the twenty-second season, was active because of recent delayed selling when buyers had expected a sharp price decline. Of interest to the rubber industry were displays of rubber rain footwear, rubber-soled and heeled shoes, slippers, playshoes, and athletic shoes, soles and heels of synthetic and/or natural crepe or molded rubber, rubber slabs, and leather substitutes. Neolite, Panelene, and Leathlyke were some of the types of soling shown.

Included among the exhibitors were: Converse Rubber Co., Athletic Shoe Co., Bata Shoe Co., Inc., Bristol Mfg. Corp., Brooks Shoe Co., Cambridge Rubber Co., Ideal Shoe Co., Drexsage & Co., Inc., Endicott Johnson Corp. of Mass., Norwalk Tire & Rubber Co., Rubber Brokers, Inc., Elliot E. Simpson Enterprises, Simpson's Miracle Products, Inc., So-Lo Works, Inc., Winchester Rubber & Plastic Co., Cat's Paw Rubber Co., Inc., Prudential Shoe Mfg. Co., Wellco Shoe Corp., H. H. Brown Shoe Co., Inc., Chas. Kemler Shoe Co., Campus Shoe Co., Roberts-Hart Inc., Poloner Shoe Co., and Allen-Squire Co.

Leaderman Joins NBS

Herbert Leaderman has been appointed to the Division of Organic & Fibrous Materials of the National Bureau of Standards, Washington, D. C., where he will do research on the fundamental mechanical properties of high polymers. Dr. Leaderman had previously done work on the elastic and creep properties of rubber, plastics, and textile fibers, chiefly for the Textile Foundation and for Firestone Tire & Rubber Co. He has also done development work on wire resistance-strain gages for the National Advisory Committee for Aeronautics and on radar antenna housings for Massachusetts Institute of Technology's radiation laboratory.

Dr. Leaderman received his bachelor's degree from the University of Cambridge in 1934 and began his work on rigid plastics at Aero Research, Ltd., in England. From 1938 to 1943 he was a member of the staff of M.I.T., where he engaged in research on the mechanical properties of textile fibers and rubber-like plastics for the Textile Foundation. From 1943 to 1946 he was associated with the M.I.T. radiation laboratory and before joining the Bureau of Standards had been with Firestone doing work on the elastic and creep properties of rubber.

I. B. Kleinert Rubber Co., 485 Fifth Ave., New York 17, N. Y., has added several salesmen to its force: Don C. Wittman to assist William Pottebaum in Texas; Stanley Larsen to assist Arthur Greenfield in Minnesota, North and South Dakota, and Iowa; Aaron Hardwick to replace Harry Epstein in upstate New York, as Mr. Epstein will remain in the New York showroom and also have charge of the resident offices; and Seymour Gordon to cover Mr. Hardwick's former territory in Kentucky, Tennessee, and West Virginia.

New York Safety Convention

The Eighteenth Annual Safety Convention and Exposition, sponsored by the Greater New York Safety Council and cooperating agencies, was held at the Hotel Pennsylvania, New York, N. Y., on April 13 to 16. The exposition featured the displays of 88 companies and included the newest developments in safety engineering together with such old standbys as first-aid kits, safety shoes, nonskid flooring, respirators, etc.

Following in the trend of previous expositions, rubber and rubberized items were very much in evidence, and there were indications of expanding use of plastics for protective clothing, face shields, flooring, etc. Displays of reclaimed rubber mats and link-type scrap rubber mats were shown by American Mat Corp., Toledo, O., and N. A. Brabrook Co. Rubber goggles were displayed by American Optical Co., New York, and Bausch & Lomb Optical Co., Rochester, N. Y. Full lines of rubber safety items, including masks, goggles, respirators, and hoods, were exhibited by Guardian Safety Equipment Co., East Orange, N. J., Mine Safety Appliances Co., Inc., Pittsburgh, Pa., Pulmosan Safety Equipment Corp., Brooklyn, N. Y., Scott Aviation Corp., Lancaster, N. Y., Standard Safety Equipment Co., Chicago, Ill., Willson Products, Inc., Reading, Pa., and W. S. Wilson Corp., New York.

Rubber and rubberized clothing, such as jackets, aprons, boots, and gloves, were displayed by Millburn Co., Detroit, Mich., Miller Products, and Olympic Glove Co., both of New York, and Safety Clothing & Equipment Co., Cleveland, O. Exhibits of safety shoes featuring rubber heels and soles were shown by Iron Age Division of H. Childs & Co., Inc., Pittsburgh, Lehigh Safety Shoe Co., Inc., Allentown, Pa., Safety First Shoe Co., Holliston, Mass., Sundial Shoe Co., Manchester, N. H., Thom McAn Safety Shoes, New York, and Titan Safety Shoe Co., Boston, Mass. Among the other displays were exhibits of air valves and air-operated machine guards by A. Schrader's Son Division of Scovill Mfg. Co., and rubber buckets for acid handling by Wahlert Products Corp., both of Brooklyn.

Under the general chairmanship of Edward A. Fullarton, Travelers Insurance Co., the safety convention presented an intensive four-day program. All phases of industrial, marine, and domestic safety were discussed at 46 individual sessions, during which some 91 papers were presented, and at 16 panel and forum meetings. In addition the program included safety demonstrations, showings of motion pictures on safety, committee meetings, luncheons, and the Council's annual dinner on April 15.

Theodore A. Werkenthin, principal materials engineer, civilian in charge of the rubber sub section of research and standards, Bureau of Ships, United States Navy Department, Washington, D. C., in line with the ever-increasing close relation between rubber and petroleum, has been assigned additional duties as civilian in charge of the special fuels section of this same research and standards branch. The special fuels section is responsible for research on petroleum, synthetic and special fuels, hydraulic oils, greases, lubricants, and additives, including work on oil shale, coal, oil, and tar sands, natural gas, Gilsonite, etc.

Rubber for Beauty

The 1948 International Beauty Show, geared to beauty shop owners and operators, was held in Grand Central Palace, New York, N. Y., April 5 to 8. Manufacturers' exhibitions, beauty appliance and application demonstration booths, and lecture rooms covered the first two floors of the Palace.

Featured in this, the twenty-sixth annual convention and exhibition, were numerous articles wholly or partly made of rubber and/or plastics, such as display figures, massage equipment, combs and brushes, machine cabinets, furniture upholstery and covers, toothbrushes, women's razors, shampoo capes, booth curtains, hand slenderizers and massagers, dispensers, curlers, and atomizers.

The show, slower this year than usual, had articles made of raw materials supplied by Carbon & Carbide Corp., E. I. du Pont de Nemours & Co., Inc., Catalin Corp., The B. F. Goodrich Co., Sponge Rubber Products Co., Castle Rubber Co., American Hard Rubber Co., S & G Rubber Co., Inc., and Vulcanized Rubber & Plastics Co., among others.

Among the 188 exhibitors present utilizing rubber and plastics were: Automatic Massage Table Corp., Amity Plastics, Inc., Aviatrix Corp., N. B. Cohen Co., Gloria Figures, Inc., Diadem, Inc., Halliwell, Inc., Henry Kayser & Fils, Inc., Kimberly-Clark Corp., MacLevy Equipment Corp., Peter J. Michels, Inc., National Machine Co., Para Mfg. Co., Inc., Petra Mfg Co., Spartan Products Co., and Vulcanized Rubber & Plastics Co.

Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N. Y., at the recent stockholders' annual meeting approved a change in the company's name to Mathieson Chemical Corp., authorized the issue of 500,000 additional shares of common stock, approved the retirement of all but the present outstanding shares of preferred stock and elected directors for the fiscal year, according to A. U. Fox, chairman of the board. The change from the original name, adopted when the company was formed in 1892, is for the purpose of identifying the company with its increasingly diversified line of products, Mr. Fox explained.

Mathieson Chemical also announced election of officers last month, as follows: chairman of the board, George W. Dolan, to succeed A. U. Fox, resigned; president and chief executive officer, Thomas S. Nichols, to succeed Mr. Dolan; vice president, John C. Leppart. The following officers were reelected: A. T. Bennett, vice president-general manager of operations; Howard Berry, vice president and treasurer; D. W. Drummond, vice president-general manager of sales; J. V. Joyce, vice president and comptroller; E. E. Routh, vice president-director of sales; and A. P. Winsor, secretary.

Pantasote Co., Passaic, N. J., has moved the office of Vice President R. M. McGuire to Detroit, Mich., to handle the company's growing automotive business and to direct sales throughout the Midwest. Pantasote produces Lifewall, new vinyl wall covering; Lifefloor, vinyl floor tile; Pantex, unsupported vinyl film; railroad car curtains and slating and other products for the furniture, handbag, automotive, and other fields.

Executive Changes at Raybestos

John F. D. Rohrbach last month was elected president of Raybestos-Manhattan, Inc., Passaic, N. J. at a meeting of the board of directors. He succeeds Sumner Simpson, who had been president since the formation of the corporation in 1929 and who now becomes chairman of the board and of the finance committee.

Mr. Rohrbach, who joined the company in 1939, has served as assistant to the president, executive vice president, and treasurer. Previous to that time he had been a senior partner in the accounting firm of J. Lee Nicholson & Co., where for many years he worked in close association with Raybestos-Manhattan in financial and advisory management capacities.

The office of chairman of the board was unoccupied since the death of Col. A. F. Townsend in 1940. Other officers named at the same meeting were W. H. Dunn, former comptroller, who was elected treasurer, and W. W. Kievit, formerly secretary, who was elected comptroller and secretary.

Two new members added to the board of directors were W. S. Simpson, director of personnel of The Raybestos Division, and George W. Marshall, Jr., general manager of the Asbestos Products Division.

Manhattan Rubber has played a part in the development of bowling balls for veterans who have lost both hands. About six months ago Harold E. Bork, an armless veteran, conceived an idea which he believed would make bowling possible for amputees having artificial arms equipped with hooks for hands. The special spring arrangement needed for such a bowling ball was made by Accurate Spring Co., and Mr. Bork soon demonstrated the feasibility of his idea. The balls he used were Manhattan's donated by the Ohio Bowling & Billiard Supply Co. and by Universal Bowling & Billiard Supply Co. The spring device will be installed free of charge on any bowling ball for double amputee veterans by the Accurate Spring Co., Chicago, Ill.

Manhattan Rubber Division also has added the Ray-Man V-Belt to its line of industrial rubber products. The new belt was developed to meet the need of a belt possessing features particularly applicable to tough, rugged drives. The engineered strength members of the belt have been designed for this type of service, and the added features of oil, heat, and static resistance provide a belt suitable for unusual service requirements, it is claimed.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., is now producing a mattress cover and hospital sheeting of unusual strength. Developed at the Fairfield, Conn., plant and laboratory of the company's fabrics division, the sheeting has a nylon base coated on both sides with neoprene; it is sold under the Fairprene trade mark. Development of this material began at the request of several state mental institutions whose patients would tear up ordinary rubber hospital sheets. The new sheeting, it is said, has very high tensile strength, good abrasion resistance, and is resistant to oil, boiling water, steam, chemical sterilization, cracking, peeling, and sticking. For sale as Fairprene #9435-N, the sheeting is 36 inches wide and is available in standard-size rolls of 50 yards and half rolls of 25 yards.

Erie Foundry Co., Erie, Pa., has announced that Harry L. Showalter, for many years associated with the drop forging industry in various capacities, has joined its staff as sales representative in eastern Pennsylvania, New Jersey, Maryland, and Delaware. Mr. Showalter served as a lieutenant with the U. S. Navy during the late war. R. N. Yates is sales manager of the Erie company, which manufactures forging hammers and hydraulic presses.

Thermoid Co., Trenton, N. J., held its annual shareholders' meeting on April 13, at which two new directors were elected, Paul Sowell and Guy G. Gabrielson. President F. E. Schluter informed stockholders that the plant and product diversification program of the company made possible record sales last year and promises continuing growth. Installation of new machinery at the Southern Asbestos Division has been completed, with a larger potential than ever. Rotary hose is now in production at the company's plant in Utah, which began operations last November, and equipment installation is about completed for the manufacture of wire-braided and other types of high-pressure hose. The company hopes to have the Utah plant on at least two shifts before the year-end. Mr. Schluter further announced that a new line of hydraulic brake fluid and brake parts has been added to the automotive sales division, and the company anticipates the addition of $1,000,000 minimum annual sales volume. The Thermoid president foresees no severe decline in sales although some softening of demand for heavy industrial rubber products has been experienced, but sales of friction materials are expected to exceed 1947 figures, and the company's textile division has just completed an excellent first quarter.

The Warwick Chemical Co. division, Sun Chemical Corp., has moved its offices from 580 Fifth Ave., New York, N. Y., to the Sun Bldg., 10-10 44th Ave., Long Island City, N. Y. The increased scope of the Warwick operation necessitated these larger quarters. The adjacent facilities of the laboratories will enable Warwick to enlarge its extensive technical consumer services. Warwick manufactures textile chemicals, including the water repellents, Impregnole and Norane, plastic inks, and organosol dispersions, as well as metallic stearates and petroleum waxes. Warwick operates manufacturing plants in West Warwick and Wood River Junction, R. I., and Rock Hill, S. C., as well as petroleum refineries at Chanute, Kan., and Kilgore, Tex. Sales offices and warehouses are located from coast to coast.

Earl Bunting, president of O'Sullivan Rubber Corp., Winchester, Va., and chairman of the board of directors of the National Association of Manufacturers, on April 23 was elected managing director of NAM at the board meeting in Detroit, Mich.

Koppers Co., Inc., Pittsburgh, Pa., will start engineering work at once on the $4,500,000 government demonstration plant for making synthetic liquids fuels at Louisiana, Mo. Actual contruction work probably will get under way within three months, and it is hoped to have the plant in operation within 15 months.

Changes at U. S. Rubber

J. F. Hensgen has been appointed special mining representative for the midwestern division of the United States Rubber Co., Rockefeller Center, New York 20, N. Y. He will assist engineers in the selection of conveyer belting, wire and cable, and other rubber products used in the coal mines of Kentucky, Illinois, Indiana, West Virginia, Missouri, Arkansas, and other midwestern states. Mr. Hensgen has been associated with U. S. Rubber's St. Louis branch since 1923.

Lawler B. Reeves, formerly manager of farm market sales for the tire division, has been appointed assistant director of manufacturers sales for the division, with headquarters at Detroit, Mich. A native of Wapanucka, Okla., Mr. Reeves joined U. S. Rubber in 1941 as a salesman at Oklahoma City. He obtained a leave of absence during the war to serve with the Army Air Force. Upon his return to the company at the close of the war, Mr. Reeves was placed in charge of aircraft tire sales and was later appointed manager of farm market sales.

Edward J. Matthews has been appointed manager of the shoe products department, with full supervision over the production and the sale of rubber heels and soles and shoe cements, with headquarters at the Providence, R. I., plant. After completion of his education at Northeastern University, Mr. Matthews joined Charles A. Grosvenor Shoe Co., in 1920, where he remained until 1937, when he started with U. S. Rubber as manager of shoe product development. In recent years he has been the company's representative for the shoe manufacturing trade in New England.

U. S. Rubber has appointed Henry A. Rome manager of molded goods sales to succeed F. W. Archibald, who is retiring after 40 years of service. Mr. Rome began his rubber career in 1915 as an order clerk in the company's former plant at New Durham, N. J. Later he was transferred to Cleveland, where he held various positions in manufacturing and sales. In Cleveland he attended night classes at Baldwin-Wallace College, specializing in law, and subsequently was admitted to the Ohio Bar Association and the American Bar Association. He is still a member of these organizations. Since 1931 he has been associated with the company's molded goods department in Passaic, N. J.

Mr. Archibald started as a clerk in the company's Boston branch. Later he was stationed in New York and Cleveland and since 1934 has been manager of molded goods sales.

New Tire Announced

A new extra-quality low-pressure passenger-car tire said to give up to 60% more safe mileage than ordinary tires has been announced by U. S. Rubber. Known as the new U. S. Royal Master, the new tire combines the riding qualities of low-pressure construction with greater mileage achieved by a 25% deeper tread of specially compounded and long-wearing "tempered" rubber. According to J. W. McGovern, vice president and general manager of the tire division, the new tire is so constructed that the original skid protection and safety action of the tread can be renewed after long mileage through a company-sponsored service program among its dealers. The tire combines the safety features of the former Royal Master with low-pressure riding comfort and added mileage, Mr. McGovern said and estimated that it would give nearly twice as much safe mileage as conventional prewar types. Despite its larger size, the new tire fits standard-size rims on all present makes of cars.

A nylon-reinforced V-belt claimed to have twice the strength and four times the average life of conventional V-belts has been developed by U. S. Rubber. The belt contains a series of tough nylon cords covered with a special synthetic rubber compound resistant to heat and oils and is particularly recommended for power transmission on equipment subject to rough usage, such as harvesting and processing combines, and railroad, mining, oil well, and paper processing machinery. Besides high tensile strength, the belt has great flexibility and sufficient elasticity to absorb shocks. The new belt will be distributed under the name of U. S. Royal Super Service V-Belt and will be made in both fractional and multiple sizes. Its price will be about 40% higher than that of belts made with standard cotton cord construction.

A new slippery finish for electrical wires has been developed by U. S. Rubber to make the wire pull more easily through sharp bends in conduits. The slippery surface is produced by a new wax coating on the insulation which is said to make the wire slide with one-half to one-third the amount of pulling previously required. The wax is used on the company's Laytex wire, widely employed in homes and commercial buildings, and is expected to speed up the installation of electrical equipment, particularly in locations difficult of access and where sharp angled conduits are used.

Neutral-color rubber heels and soles which harmonize with either black or brown shoes were recently announced by U. S. Rubber. The new heels and soles are made of natural and synthetic rubber combined with plastics, and the neutral shade is obtained by scientific blending of pigments to produce a color which is neither black nor tan. Instead of carbon black, new synthetic ingredients are used in the manufacturing process to give a rubber which will not mark floors. The new heels and soles are said to be long wearing and highly resilient. Distribution to shoe repairmen is to begin immediately.

The outfield walls at Ebbets Field, home of the Brooklyn Dodgers baseball team, have been padded with chemically blown sponge rubber to help protect over-zealous outfielders. Produced by U. S. Rubber, the rubber padding is one inch thick and covered with heavy mildewproof duck. A waterproof coating of neoprene is used on the inside of the duck to give additional protection from the weather. The padding was made in sections 12 feet long and 50 inches wide at the company's Naugatuck, Conn., footwear plant, and smaller sections were designed to fit irregular areas. The padding was installed about 32 inches from the ground and is anchored securely to the wall.

Yarnall-Waring Co., Mermaid Lane, Philadelphia 18, Pa., last month announced these appointments in its sales department: R. S. Pollard, formerly of Pyle-National Co., now sales manager of the steam trap division; Leland C. Campbell, named Southwestern representative, working from the Dallas sales office; Howard R. Wunker, sales representative in the company's new Cincinnati office; and J. Frank Long, sales representative in the company's new St. Louis office.

United Rubber Machinery Exchange is now located at new quarters at 183-89 Oraton St., Newark 4, N. J. The company recently completed the new office and warehouse building there. Other installations and equipment have been installed to facilitate the handling of machinery. With the installation of new cranes and railroad sidings United Rubber Machinery is in a position to give even better service than in the past. M. J. Liebstein is proprietor and general manager of the concern; M. Sokol is assistant manager, and P. Stanley, general superintendent.

War Assets Administration, Washington, D. C., in its recent listings of surplus property for sale included rubber life rafts, and rubber hose, gaskets, batteries, and miscellaneous rubber products.

Rodic Rubber Corp., New Brunswick N. J., manufacturer of rubber rolls, sheets extrusions, bonds, seals, molded items, and other industrial products, has appointed John H. White, Jr., vice president and general manager. Mr. White formerly was chief of administration and manufacture at Picatinny Arsenal, N. J., with the rank of colonel in the U. S. Army. Previously he had been director of sales promotion for the American Gas Association and also had owned and operated the Hamlin Canning Co., Inc.

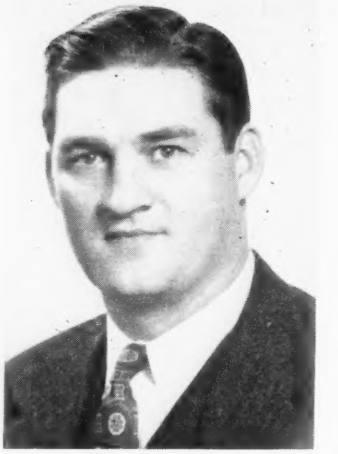
MIDWEST

New Headquarters for W. S. E.

The establishment of a research center where engineering organizations may gather becomes a reality on May 1 when the Western Society of Engineers completes its move to new headquarters at 84 E. Randolph St., Chicago, Ill. The 79-year-old organization has taken the lead in establishing an engineering and scientific center in Chicago. Other organizations of similar interests and professional standards will be invited to share in the expanded headquarters.

W. V. Kahler, president of the Society, has estimated that it will spend approximately $100,000 in renovating and equipping the center. When finished, the center will include meeting rooms, offices, lounges, and dining facilities. The center will be temporarily housed on the fourth floor of the Taylor Bldg., while structural and interior changes are being completed on the fifth, sixth, and seventh floors.

Bjorksten Research Laboratories, 185 N. Wabash Ave., Chicago 1, Ill., has added a patent department for service to clients, for collaboration with corporate patent departments, for counsel in chemical cases, and for handling chemical patent problems and negotiations. This new department will be headed directly by President Johan Bjorksten, who is also registered to practice before the Patent Office. S. Jackson, LL.B., has joined the department, and Foster York, well-known Chicago chemist and patent lawyer, has been retained as counsel.



A. E. Laurence

Phillips Petroleum Co., Bartlesville, Okla., has appointed Albert E. Laurence technical sales representative of its rubber chemicals division for New Jersey, southeastern New York, including the City of New York, eastern Pennsylvania, Maryland, and Virginia, with headquarters in Trenton, N. J. Mr. Laurence will handle sales and technical service of Philblack O and Philblack A, new-type furnace blacks which Phillips is marketing. Al Laurence was graduated with honors in chemical engineering from the Armour Institute of Technology in 1935 and has since been continuously identified with the rubber industry. He started with the Goodyear Tire & Rubber Co. and served five years in the tire compounding division before joining The Solo Works as chief chemist. The past six years have been spent with The Thiokol Corp in its laboratory and as Midwest sales service engineer. Mr. Laurence is a member of the Division of Rubber Chemistry, A. C. S., and was instrumental in the recent formation of the local A. C. S. section in Trenton.

First Anniversary of Texas City Disaster

On April 16, Texas City, Tex., observed the first anniversary of the greatest industrial disaster in world history. With the exception of memorial services for the 512 persons killed in the explosion, it was just another day for the bustling city which has made good its slogan to build a greater Texas City.

Monsanto Chemical Co.'s styrene plant suffered the greatest damage, and 145 of its personnel were killed and hundreds injured. The still-unsettled insurance claim for Monsanto's loss represents the largest single risk loss in the history of insurance, being $22,317,937. The company suffered a substantial amount of loss in excess of the insurance coverage. Earlier in the month Monsanto filed a $50,000,000 damage suit against the government for loss and damages resulting from the destruction of its plant, including damages to the plant, loss of profits from the plant, and loss of services of the skilled personnel killed in the disaster. This claim was for the total loss suffered, including losses covered by insurance.

Stating that the government by reason of its large manufacture of ammonium nitrate for military explosive purposes had knowledge of the potential hazards of the material, the company charged the government with the responsibility for the explosions. The ammonium nitrate that exploded aboard the *S.S. Grandcamp* and *S.S. High Flyer* had been manufactured, packed, and shipped from three government Ordnance Department plants. The material had been produced and packed in accordance with government specifications and instructions and had been shipped under government bills of lading.

The claim stated that the ammonium nitrate granules were coated with a waxy material and packed in paper bags containing asphalt interlayers, all of which increased combustibility of the product and heightened the possibility of fire and resulting explosion. Although the material was known to be highly explosive, these bags were innocently labeled as "fertilizer" with no warnings or precautionary notices on the bags or shipping documents, the company charged.

On the day following the disaster, Monsanto announced that the plant would be rebuilt on the same site, and plans were immediately made to rebuild a virtually identical plant. Construction began last August and has proceeded steadily. Buildings and production units are nearing completion, and it is believed that operations will start in the near future. Approximately 2,000 construction workers have been employed in the rebuilding. Monsanto employes who had not received other work with the company were given first choice with the contractors. As old jobs were reestablished, the men were called back to Monsanto. At present, 258 of the 621 Monsanto employes at the time of the disaster are back on their jobs, and 144 are on contractors' payrolls. According to Plant Manager H. K. Eckert, who was himself seriously injured in the blast, clearing of the plant was like building it in reverse. Work began with equipment that could be reused, and "we had to build a plant around what we had left," he explained.

Changes in Personnel

Frederic Matthews has been appointed director of research for the Merrimac division; he succeeds W. S. Wilson, who will be free to devote full time to special research projects in the paper chemical industry and allied fields. Merrimac division, with headquarters in Everett, specializes in paper, leather, textile, and surface coating chemicals as well as in heavy chemicals. Dr. Matthews is a graduate of Columbia University with an M.A. and a Ph.D. in physical-organic chemistry. He joined Monsanto after receiving his doctorate in 1939.

Prescott Sandidge has been appointed assistant director, with responsibility for administrative matters, at the central research department, Dayton, O. Mr. Sandidge previously had been executive director of the Clinton National Laboratories, operated by Monsanto for the Atomic Energy Commission. After graduation from the University of Louisville, Mr. Sandidge was employed by Monsanto in December, 1923, as an assistant in the engineering department in the Anniston, Ala., plant. He served in various capacities in the Anniston and Camden, N. J., plants until 1937, when he became assistant to the general manager of the company's phosphate division. In 1939 he was made comptroller of the plastics division at Springfield, Mass.; early in 1942 was transferred to a similar position in the

Texas City and Marshall, Tex., plants; in 1944 became special assistant to the comptroller, in charge of war contract terminations, at the St. Louis offices; in June, 1946, was appointed assistant executive director at Clinton Laboratories, and, in July, 1947, became executive director of that operation.

Rhoderic K. Patrick has been named a salesman in the aircraft coating sales development section of the Merrimac Division. Connected closely with the aviation industry in the Central States for several years, Mr. Patrick has been assigned to sales of Skylac, the division's flame-retarding fabric surface coating for aircraft.

Frederick W. Meuschke has been made assistant sales promotion manager of the plastics division, Springfield, Mass. He has been advertising manager of Rumford Chemical Works, Rumford, R. I., for the past three years. A native of Richmond, Va., Mr. Meuschke is a graduate of Concordia College and the New York University School of Marketing. He was assistant advertising manager of the Manufacturers Trust Co., New York, for six years prior to joining Rumford. During the war he served at the Armored School, Fort Knox, Ky., for three years, with the rank of captain.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., has appointed C. C. Wiley, heretofore district sales manager at Birmingham, district sales manager at Baltimore, to succeed H. Merrill Bowman, recently made assistant divisional sales manager for power transmission, with headquarters in Chicago. James Tommie Bell succeeds Mr. Wiley at Birmingham.

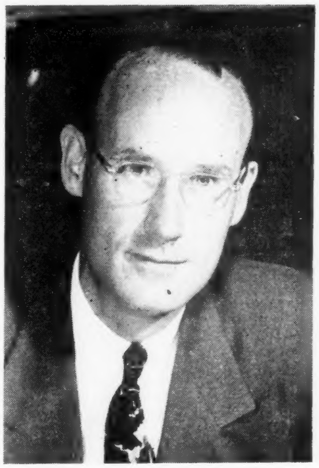
Mr. Wiley started with Link-Belt in 1926 at the Philadelphia plant as secretary to the chief engineer. In 1927 he became assistant manager of the Philadelphia plant's factory branch store, was transferred to the Pittsburgh office in 1929, and was made district sales manager at Birmingham in 1946.

Mr. Bell, a native of Florida, received his B.S. in civil engineering at Georgia School of Technology in 1942. Then he went directly into the U.S. Army, Corps of Engineers, serving 35 months overseas and was discharged in November, 1945. Mr. Bell joined the Link-Belt Atlanta plant in January, 1946, where he received an intensive training course on the construction and application of Link-Belt company products to all types of industries.

The Dow Chemical Co., Midland, Mich., recently transferred to its plastics and industrial chemicals sales staff Lemuel D. Harvey, of the Houston, Tex., office; while Walter A. Sheehan, of the Boston, Mass., office also has assumed new duties as a plastics and protective coatings salesman.

Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill., has appointed M. S. Agruss director of the research and development department. Previously Dr. Agruss had been a consultant in the field of petroleum technology and chemistry and also research supervisor with the Pure Oil Co. for ten years. During the war, he was a member of the Petroleum Industry War Council as well as associated with the Manhattan Project.

OHIO



John O'Neil

General Tire Elections

The board of directors of The General Tire & Rubber Co., Akron, reelected intact at the annual shareholders' meeting last month, named John O'Neil, son of William O'Neil, president, as treasurer of the company. The younger Mr. O'Neil succeeds Winfred E. Fouse, who with President O'Neil, was cofounder of the company in September, 1915.

While appointing John O'Neil, a 30-year old World War II veteran, to the treasurership, the directors renamed Mr. Fouse as a vice president and also reelected all other officers. W. O'Neil, renamed by the shareholders as chairman of the board, was also reelected president and general manager, the capacity he has held since the formation of the company. Other officers reelected follow: C. J. Jahant, L. A. McQueen, S. S. Poor, D. A. Kimball, and C. F. O'Neil, vice presidents; Hayes R. Jenkins, secretary; F. W. Knowlton, assistant secretary; and T. S. Clark, assistant treasurer.

Mr. Fouse, now 70 years of age, also will continue as a member of the board of directors.

Other directors reelected were: Messrs. Jahant, McQueen, Poor, Jenkins, C. F. O'Neil, Robert Iredell, Joseph R. Kraus, and Howard Jordan.

In addressing the shareholders President O'Neil said:

"The rubber business is back to normal, and despite the normally slow winter in sales, we are confident that warm weather will bring a buying spree in tires. Our sales so far in 1948 in products other than tires are ahead of last year's record volume."

W. O'Neil's third son, John O'Neil, was graduated from Holy Cross College in 1938 with an A.B. degree. He also is a graduate from the Harvard Law School, completing this training in 1941, just prior to entering the service. The new General treasurer, just back from a business trip to Venezuela, served as a lieutenant in the air-sea rescue division of the Coast Guard. He has been associated with the company's treasury department since he was released from active duty. He is unmarried.

Two promotions in the manufacturing personnel of General Tire's foreign operations were announced last month by A. W. Phillips, manager of manufacturing. Howard Swires, leaves as assistant plant superintendent of General's Mexico affiliate to become plant manager of the company's new Argentine affiliate at Buenos Aires; while Joe Delaplane, formerly with the facility engineering department, succeeds Mr. Swires in Mexico.

Mr. Swires came to the company immediately upon graduation from East High School, 15 years ago, and retained his production job during the years he was earning his degree at Akron University (1939). General's war plant in Akron, which produced barrage balloons, life boats, military raincoats, and many other necessary items, was under Mr. Swires' supervision before he took the Mexico City post.

Mr. Delaplane also worked for the rubber company to help defray college expenses. He went from Wabash, Ind., High School to the physical testing laboratory at General's Wabash plant. A year later he enrolled at Purdue University, working at his old job during summer vacations. He was graduated in 1941 with a B.S.M.E. degree. Upon graduation Mr. Delaplane joined the Navy, serving until September, 1945, when he was discharged as a lieutenant commander, a rank he now holds in the active reserve. With his Navy discharge, Mr. Delaplane came into Akron, working first with the methods department. He was assigned to the facility engineering department in October, 1946.

Pyramid Rubber Co., Ravenna, manufacturer of Evenflo Nursers, according to President R. W. Askanse, has appointed Ben R. Frost general sales manager and Gerald Prager eastern sales representative. Mr. Frost, who comes to Pyramid from the Cleveland division of the Container Corp., is well acquainted with the wholesale and retail drug field, department store and syndicate trade through his former connection with McKesson and Robbins. Mr. Prager has had many years' experience calling on the retail and wholesale trade. He will make his headquarters in New York, N. Y.

The Highway Traveler, the new deluxe 50-passenger compartment coach recently announced by Greyhound Corp., incorporates Firestone Tire & Rubber Co. and Goodyear Tire & Rubber Co. developments which are considered important contributions to transportation safety. The new coach uses Firestone's Wire Cord tires and newly perfected crashproof gasoline tank. The Wire Cord tires recently completed satisfactorily a 100,000-mile high-speed test in cooperation with Southwestern Greyhound Lines. The Firestone gasoline tank is an adaptation of many of the features of the self-sealing fuel tanks used in combat planes. The weight of the tank has been considerably reduced, and the self-sealing features have been developed into resiliency factors in line with bus and motor transport needs. The resiliency of the tank is increased by the use of a non-rigid suspension in installation. Other models of the new coach have been equipped with special Goodyear 11.00-19, white sidewall, All-Weather tread, nylon cord tires, with Goodyear LifeGuard safety tubes in the two front tires for added safety. The new coach will tour throughout the nation for demonstration purposes.

A. Schulman, Inc., Akron, has advanced Eugene Slingluff to the position of manager of Schulman's new department, new and used machinery division. Mr. Slingluff is also general sales manager of the company's plastics division. The new department, under Mr. Slingluff, will promote sales of rubber and plastics processing machinery.

Eugene Slingluff

Dayton Rubber Co., Dayton, revolutionized existing tire construction standards back in 1923 with the first tire built for under-inflation, according to Irving Eisbrouch, company vice president. This tire gave a reduction of about 25% in the air pressure of the popular-size tire of that day and provided increased comfort and tire life and reduced skidding. On the heels of this development followed the balloon tire principle in 1925, and the tendency in tire development since then has been toward increased comfort, greater safety, and long life. Dayton will soon introduce its entry into the low-pressure passenger-car tire field, the Super Low Pressure Autocrat, following this trend. Production of this tire is being set up as rapidly as possible, Mr. Eisbrouch said, and the company hopes to have popular sizes in the hands of its distributers very soon. The "new look" in Dayton tires and women's fashions is shown in the accompanying photograph.

The "New Looks" of 1923 and 1948 in Women's Fashions and Dayton Rubber Co. Tires; Illustrated are Dayton's Low-Pressure Tire of 1923 and the New Super Low-Pressure Autocrat Tire

Drive for Safer Driving

Seiberling Rubber Co., Akron 9, has launched a campaign to make every filling station attendant and tire salesman in the country a spokesman for automotive safety. The company has asked its dealers to close every customer contact with the phrase, "Safe driving to you!" In a letter to dealers, L. M. Seiberling, company sales manager, urged that sales employes use the phrase as a parting remark, preferably when the customer is in his car. "It may stick long enough to prevent a dangerous accident," Mr. Seiberling said.

The company is writing other tire manufacturers, oil companies, and other firms with national distribution in the automotive field suggesting that they have their dealers take up the use of the phrase. The program is being conducted in cooperation with the National Safety Council's nationwide campaign to prevent traffic accidents.

Seiberling held its annual meeting of stockholders on April 12 at which Warren H. Snow, president of E. H. Rollins & Sons, Inc., New York investment firm, was elected a director. All other directors were reelected, bringing the total this year to nine, as against eight last year. Reelected members include: F. A. Seiberling, reelected chairman for his eleventh consecutive term; J. P. Seiberling, president for the same period; H. P. Schrank, vice president in charge of production; J. L. Cochrun, vice president in charge of sales; R. J. Thomas, vice president and treasurer; A. C. Blinn, chairman of Ohio Edison Co.; Robert Guinther, Akron attorney and company counsel; and L. M. Seiberling, sales manager.

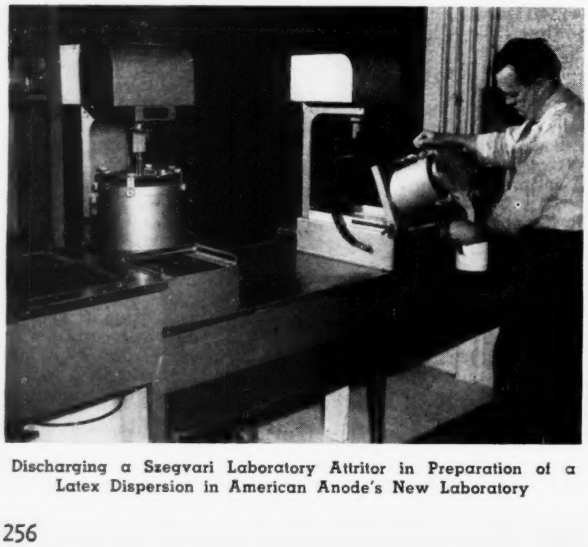
F. A. and J. P. Seiberling and Mr. Blinn continue as executive committee.

Present officers of the company were reelected at a directors' meeting which followed the stockholders' session. Officers besides the board members include: C. E. Jones, vice president and comptroller; W. P. Seiberling, secretary; H. E. Thomas, assistant secretary and assistant treasurer; J. W. Dessecker, assistant secretary; and W. H. Oburn, assistant treasurer.

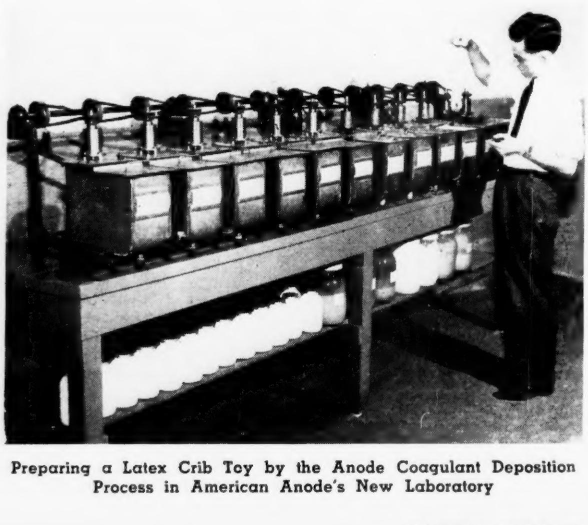
The Seiberling company, according to Vice President Schrank, on April 26 increased its work schedule for all tire manufacturing operations from a five- to a six-day week.

L. L. Smith, treasurer of The B. F. Goodrich Co., Akron, completed 40 years with the company on April 6. He had joined Goodrich as a tire adjuster immediately after his graduation from school in 1908 and was named assistant manager of the Kansas City district the same year. As a sales supervisor, he traveled extensively in the Midwest for several years before being transferred in 1915 to the company's Akron offices as a credit man. In 1918 he became a general credit manager, in 1920 assistant treasurer, and in December, 1940, treasurer.

American Anode, Inc., manufacturer of latices and mixes of crude and American rubbers, as well as water cements and suspensions of various types, has opened a new development laboratory at 1031 Grant St., Akron. Some of the operations of the laboratory are shown below.

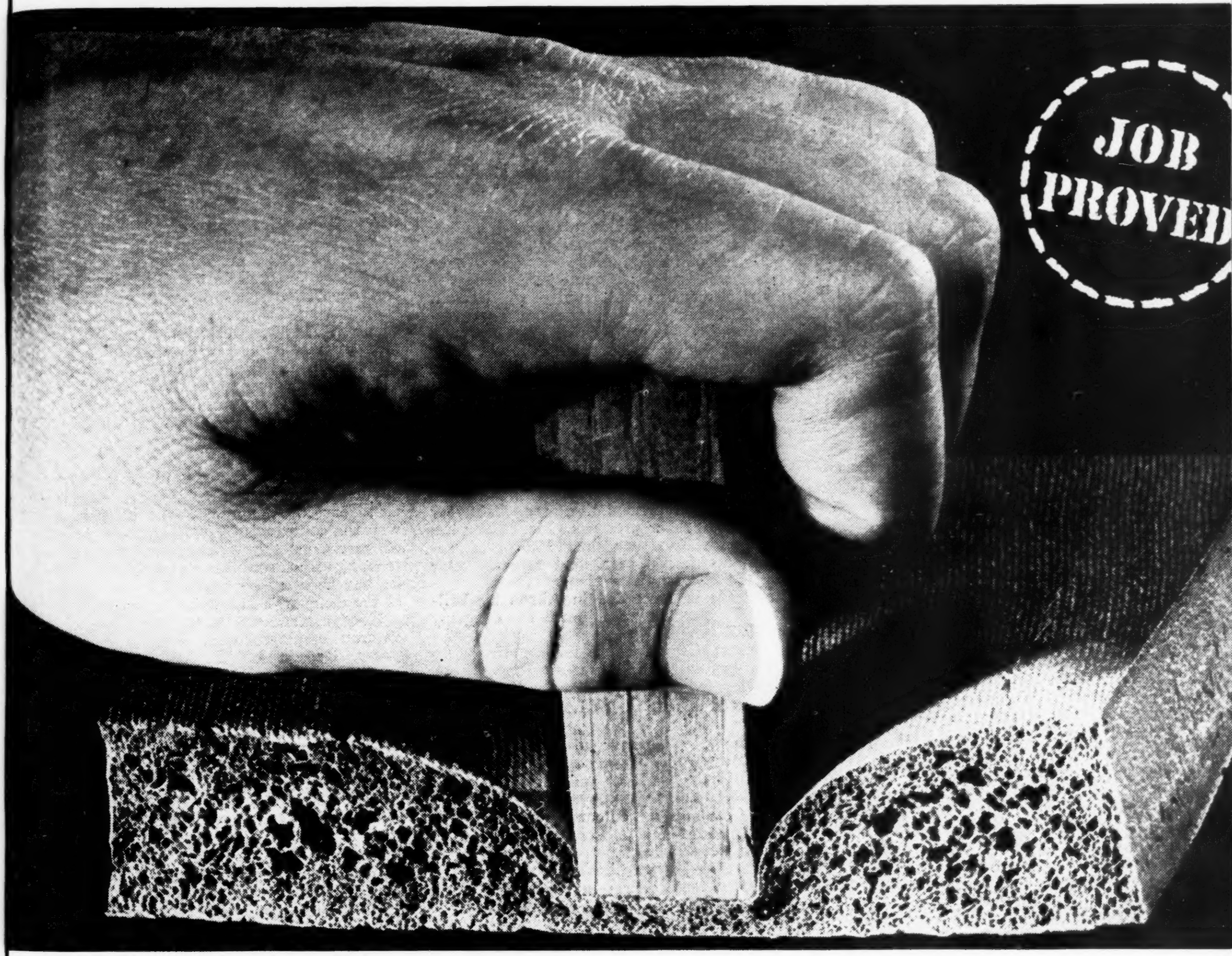


Discharging a Szegvari Laboratory Attritor in Preparation of a Latex Dispersion in American Anode's New Laboratory



Preparing a Latex Crib Toy by the Anode Coagulant Deposition Process in American Anode's New Laboratory

Cuts Migration Troubles In GR-S Sponge



CIRCOSOL-2XH . . .

Used by Leading Manufacturers of Sponge Rubber

"Our chief reason for using Circosol-2XH," says the research director of a prominent manufacturer of rubber sponge, "is that it is less migratory."

This Company uses Circosol-2XH in processing sponge rubber which is later cemented in place with the common reclaim rosin-type adhesives.

After testing Circosol-2XH they found it softened the rubber satisfactorily and did not migrate, "bloom" or affect the cement as ordinary processing oils did. Circosol-2XH gives them a margin of safety in manufacturing and helps to make possible higher production and more satisfactory application.

Circosol-2XH is a processing aid, refined by Sun as an elasticator for GR-S. It is widely used throughout the industry to speed up processing and to increase the resiliency of finished GR-S products. For complete information on Circosol-2XH and other "Job Proved" Sun processing aids for rubber, write Department RW-5.

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INDUSTRIAL PRODUCTS

SUN OIL COMPANY • *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.—Toronto and Montreal

Goodyear Reelects Officers; New Developments Reported

Stockholders of the Goodyear Tire & Rubber Co., Akron, at their recent annual meeting reelected all directors of the company. Then the board convened and reelected all officers as follows: P. W. Litchfield, chairman of the board and chief executive officer; E. J. Thomas, president; R. S. Wilson, P. E. H. Leroy, R. DeYoung, J. M. Linforth, R. P. Dinsmore, F. W. Climer, and C. Slusser, vice presidents; Z. C. Oseland, treasurer; W. D. Shilts, secretary; C. H. Brook, comptroller; H. W. Hillman and J. F. Bennett, assistant treasurers; H. L. Hyde, general counsel and assistant secretary; W. M. Mettler, assistant secretary; H. D. Hoskin, H. L. Riddle, and J. E. Caldwell, assistant comptrollers.

Tire production at the Goodyear company in Akron returned to a six-day-a-week basis on April 24, according to President Thomas. Both original equipment and retail sales demands are responsible for the improved outlook, the executive indicated.

"Production of new cars continues at a high rate in Detroit," he explained, "and on top of this there has been an earlier spring driving surge this year. Replacement sales are increasing."

Last month Goodyear announced the addition of two new lines of lower priced tires, the Marathon and the Corsair, and these also figure in the upped production schedules, Mr. Thomas stated.

A bronze plaque, emblematic of the highest award within its power to bestow upon a radio program, was presented to the creators and producers of the Goodyear-sponsored "The Greatest Story Ever Told" by the City College of New York at a luncheon at the Roosevelt Hotel on April 24. In addition an award of merit was given the Kudner Agency, Inc., for its promotion of the program sponsored by Goodyear as a public service. Rayshow, Inc., producer and creator of the widely honored program which presents the teachings of Christ in dramatized form, were presented with the plaque during ceremonies in connection with the college's fourth annual Conference on Radio and Business.

H. D. Foster, manager of Goodyear's mechanical goods division, said that first-quarter sales set a new company record for a peacetime output of industrial rubber products. Presiding over the company's annual mechanical goods conference for eastern division salesmen, held April 21 to 23 at the Park Central Hotel, New York, N. Y., Mr. Foster said that dollar sales for the first three months of 1948 were considerably greater than in 1947 when the division's business increased 20% over the best previous year. Any sharp decrease in the demand for mechanical rubber goods is not anticipated, Mr. Foster said.

"The continuing trend toward mechanized farming and mining, the long-range construction program of houses, public buildings, factories, roads, and dams, the growing emphasis on rubber in home applications—all this adds up in favor of a steady demand for mechanical rubber goods." Operations in Goodyear's mechanical goods division are expected to continue at 100% of capacity, Mr. Foster added, "as long as economic conditions remain as favorable as they are now."

Among the new Goodyear industrial rubber products presented at the conference were the previously announced ribbed-top conveyer belt for carrying "soupy" materials, and a new line of curved radiator hose which R. W. Sanborn, manager of Goodyear's hose department, said would be produced as both original and replacement equipment for the automotive industry.

District sales managers attending the conference included H. J. Mackin, New York, W. D. Bradshaw, Boston, R. B. Warren, Pittsburgh, W. H. Summers, Cleveland, L. W. Rasor, Charlotte, N. C., and J. E. Ragan, Atlanta, Ga.

Charles A. Oostdyk, Jr., has been appointed tank lining field engineer for the west coast district of Goodyear mechanical goods division. This is a new post in the company's west coast district. Mr. Oostdyk will supplement the work of Goodyear engineers in Akron and Los Angeles and supervise the installation of rubber-lined equipment. His headquarters will be in Los Angeles, where he will be responsible to R. G. Abbott, Goodyear district manager. A native of Detroit, Mr. Oostdyk studied mechanical engineering at the University of Michigan and served three years overseas as a meteorologist with the Army air force. He joined Goodyear in Akron a year ago.

Charles B. Miller has been appointed district sales manager of the mechanical goods division at Chicago. The district embraces Illinois, Wisconsin, and southern Indiana. Mr. Miller succeeds Guy E. McMahon, who will remain in Chicago as special representative for Goodyear industrial rubber products. Mr. Miller has been with Goodyear since 1937, most recently as Akron area field representative for the company's mechanical goods division. He is succeeded in Akron by William F. Burdick, who joined the company in 1937.

Robert Crafts, since 1935 an associate attorney with the firm of Jones, Day, Cockley & Reavis, in Cleveland, has been appointed a member of the law department of the Goodyear company. Mr. Crafts was born in Oberlin, O., April 12, 1910. Attending Yale University, he attained his B.A. degree in 1932 and his law degree in 1935. A veteran of World War II, Mr. Crafts is a lieutenant commander in the U. S. Naval Reserve. He went on active duty in October, 1942.

The chemical products division last month added two sales representatives to the builders' supply and flooring department: Kenneth J. Whisler, who will handle sales contacts in the eastern division of the United States; and W. George Sigler, who will do similar work in the central division. Both will have headquarters in Akron. Mr. Whisler comes to Goodyear after 12 years with another rubber company; while Mr. Sigler was formerly associated with a Pittsburgh steel warehousing plant.

M. N. Thomas has been made manager of merchandise distribution to succeed the late Herman Graham. Other appointments include: C. N. Rhoads, tire merchandise distribution manager; D. W. Bonsall, Jr., manager of mechanical goods merchandise distribution; and R. W. Young, chemical products merchandise distribution manager. All three will report to Mr. Thomas.

Mr. Thomas joined the company as a clerk in 1913, served in various capacities in merchandise distribution until 1925, when he was named assistant manager of that department, and became manager of mechanical goods merchandise in 1938.

Mr. Rhoads began with Goodyear in 1932, in the shipping room at Milwaukee. He later served as clerk in the South Bend, Ind., and Columbus, O., stores, spent a year on the production squadron at Akron, and worked consecutively as clerk, section head, chief clerk, and assistant manager of merchandise distribution department.

Mr. Bonsall, with the company since June, 1933, served in various assignments in the payroll and addressograph departments. In 1940 he transferred to mechanical goods merchandise, working as dispatcher, coordinator, and foreman. He was operating manager of the chemical products merchandise department at the time of his recent appointment.

Mr. Young, formerly manager of general merchandise and material control at the Goodyear plant in Lincoln, Neb., is succeeded there by R. G. Olds, foreman in merchandise control at Akron. Mr. Young has been with Goodyear since June, 1935. Before going to Lincoln, in 1943, he was a member of the production squadron and the priorities department.

Mr. Olds joined the company in September, 1925, as a factory clerk. He served in clerical positions in the production control department, the packing department, and mechanical goods merchandise division. In 1941 he was named head scheduler of the latter and was elevated to foreman in 1946.

Earl T. Stolberg has been production manager of Goodyear's factory at Cali, Colombia, South America, which plant produces tires, tubes, shoe products, and tire repair materials. Native of Iron Mountain, Mich., and a graduate of Marquette University, Mr. Stolberg joined Goodyear in Akron in 1941. In 1944 he won the company's P. W. Litchfield medal of merit as the outstanding production training squadron graduate. Since then he has been a foreman and an instructor at the company's industrial university.

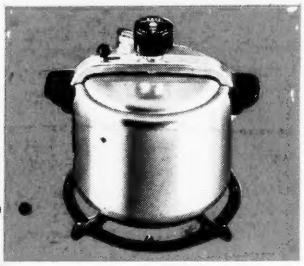
Goodyear recently honored the following veteran employes with service pins: *30 years*, George L. W. Webster, general credit manager; W. C. Killick, mechanical goods salesman, Charlotte, N. C.; E. V. Hite, district operating manager, San Francisco, Calif.; Harry J. Ryan, district manager, New York, N. Y.; Charles W. Ashbaugh, field representative for truck tires, St. Louis; *35 years*, Arthur H. Lindus, mechanical goods sales staff, Akron; A. G. Cameron, vice president and general manager, The Goodyear Tire & Rubber Export Co., Akron.

Improved Mechanical Rubber Goods

Rubber pipe developed by Goodyear hose engineers has been installed successfully in the Warner Collieries Co.'s Wolf Run coal mine, near Amsterdam, O., to replace a 600-foot metal pipe line used in ejecting acidic water. The water is of such high acid content that conventional pipe was perforated within two weeks, according to Robert Featheringham, mine superintendent. Especially compounded to conduct corrosive chemicals, the rubber pipe was installed in a single line of eight sections, totaling 380 feet and running from the pump up through the air shaft to discharge above ground. Flexibility of the hose, called Diversipipe, permitted use of air shaft route, shortening the old line by 220 feet. A novel installation feature, designed by Goodyear engineers, enabled the four-inch rubber pipe to be suspended vertically in the shaft, supported on either side by parallel steel cables.

A new glass cord steam hose is being produced by Goodyear as a result of joint research conducted by the company and Owens-Corning Fiberglas Corp. Production of the hose is carried on in Goodyear's mechanical goods division where a horizontal braider braids Fiberglas cord around a rubber tube which forms the in-

When "the heat's on"... pressure, too, this PERBUNAN gasket can take it!



When deciding on a material for the gasket of their famous pressure cooker, the Ekco Products Company chose a *Perbunan* composition because it:

1. *Does not swell, soften or lose its shape under pressure at 250° F. even when exposed to most vegetable and animal fats and oils.*
2. *Does not harden or become brittle in use or when exposed to air.*
3. *Has no taste or odor, even when boiled in water for long periods of time; not harmed by washing in hot, soapy water.*
4. *Has good physical properties such as: (a) high tear resistance, (b) good tensile strength, (c) good elongation.*
5. *Materially reduced the manufacturing cost of the* EKCO *Pressure Cooker.*

The Biggest Name in Housewares

EKCO

Other manufacturers are finding new uses for versatile *Perbunan* every day. They like its toughness and the way it stands up under severe heat, cold and a wide variety of oils, acids, and greases . . . and they like its ready adaptability to the many complex molded shapes of resilient engineering materials.

NEW FEATURE: *Perbunan's* new stabilizer permits the use of a wide variety of delicate shades that retain their original color.

Maybe there's a place in your business where the use of versatile *Perbunan* in a plastics or rubber part may save you plenty . . . both in initial cost and replacements. We will be glad to give you all the information you need.

PERBUNAN

REG. U. S. PAT. OFF.

THE RUBBER THAT RESISTS AIR, SUN, WATER, HEAT, COLD AND TIME

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

terior of the hose. Another machine puts an outer layer of rubber over the braided cord, completing the hose. In the development of this hose, a solution was reached to the problem confronting many industries, particularly the petroleum industry. These industries require a hose that can be used to conduct saturated steam under high pressure. This hose must be strong enough to withstand steam pressure without blowouts, must be flexible, must not be too bulky and must withstand mechanical breakdown due to constant flexing. In the past such hose made with cotton fabric quickly lost their strength at temperatures over 250° F. Wire fabrics possess the necessary strength, but not the desired flexibility. Steam hose made with asbestos fabric and yarn has been used, but is too bulky. According to H. E. Morse, development manager of Goodyear's mechanical goods division, Fiberglas cords are an ideal solution since they are only 0.025-inch in diameter and result in a wall only 9/32-inch thick. Coating the Fiberglas yarn with rubber is an important step in the process because it prevents the development of friction between individual cords in the finished hose. Mr. Morse also said that the new hose will carry saturated steam at a temperature of 388° F. and pressure of 200 pounds. In tests the hose has stood up under 300 hours of continuous flexing at 200 pounds' working pressure.

After exhaustive tests at Granby Dam, Colo., and other construction projects, Goodyear's mechanical good division announced the development of a new type of tread-stock cover for its Redwing air hose line. According to R. W. Sanborn, manager of Goodyear's hose department, the new hose cover utilizes a cushioning stock similar to that developed by the company for its tire treads. Softness of this heavy-gage stock affords maximum resistance to extreme abrasion and gouging common to most air service conditions. The hose is reinforced with a cabled cotton body for greater carcass strength and flexibility, and the seamless tube is unaffected by lubricants. The hose is manufactured in two types: two-braid standard for pneumatic tool service; and three-braid heavy duty for air drill usage.

Navy seaplanes can now carry complete docking facilities along with them to advanced bases because of an inflatable, rubberized fabric dock with plywood decking, light enough for air transport, that has been developed jointly by the Navy Bureau of Aeronautics and Goodyear. The new seaplane floating dock is constructed of nylon coated fabric pontoons covered with a marine-grade plywood. When completely assembled, nine of the pontoons are arranged together to form an elongated "U" shaped floating dock large enough to accommodate the huge "Mars" flying boat. To provide necessary resistance to salt water deterioration and give a steady footing for handling crews, the plywood deck panels are covered with a plastic impregnated paper and finished with Dektred, a rubber based safety footing developed by Goodyear.

Homes of the future may be heated as simply as turning on a light switch by use of Pliotherm, developed by Goodyear's chemical products division. The material is an electrical resistor and develops heat upon application of current. In construction, suitable electrical connections are attached to a sheet of Pliotherm enclosed in a covering of conventional insulating rubber. The Pliotherm unit, covered with any of a wide range of colors available in rubber and plastics compounding, lends itself to decorative and functional designs.

Goodyear's New Pliotherm Panels Provide Radiant Heating

It can be easily combined with wall board, wood panels, rubber and plastic wall coverings, moldings, and the like. Test installations have already been made successfully in a number of homes as supplements to regular heating systems, according to H. R. Thies, manager of Goodyear's plastics and coatings department. Pliotherm paneling can accomplish the complete heating of homes, particularly in mild climates, it is claimed, and in more severe climates is suited for supplementary heating of individual rooms, nurseries, milk houses and other farm buildings, and small workshops, as well as in bus, airplane, or railway cars.

Goodyear's chemical products division has assumed a formidable position in the furniture cushioning field by a multi-million-dollar expansion of its Airfoam production facilities. Runs are now being made on revolutionary new continuous production lines, expected to triple the company's present foamed rubber output. In addition to furniture, Goodyear sees an increased sales potential in the transportation field, in which it is already well established, and in the mattress industry, to which it offers Airfoam for inclusion in the manufacturer's regular mattress lines. According to R. C. Hogan, manager of Airfoam sales, a number of leading furniture manufacturers are already making use of the cushioning, and Goodyear plans an intensive educational and sales program throughout the entire furniture industry. While Airfoam is admittedly more expensive than other types of cushioning materials, the furniture industry is discovering that in a great many types of furniture the cost differential on materials is overcome by reduced labor costs and by vastly improved seating comfort, longer wearing qualities, and inherent cleanliness, Mr. Hogan said.

Firestone Adding to Its Lines

The Firestone Tire & Rubber Co., Akron, has expanded its line of passenger-car tires by the addition of two new tires, the Super-Champion and the Standard, both in the low-price field. The retail price of the 6.00-16 Super-Champion was said to be $13.95, and the Standard will sell for $12.40. According to H. D. Tompkins, vice president in charge of sales, this adding of the new tires by the company serves a double purpose: it places Firestone dealers in a fully competitive position, and it enables the motorist to choose the highest quality tire at the lowest possible price. Featuring an eight-rib, deep, non-skid tread, the Super-Champion has two extra plies under the tread, and its Safti-Locked, Gum-Dipped cord body gives increased resistance to impact and breaks. The Standard tire has a new, sturdy, curve-safe, non-skid tread. Both new tires carry the usual Firestone lifetime guarantee.

Thousands of dollars and manhours can now be saved by a new dynamometer which is said to measure more accurately horsepower requirements for heavy-duty earth-moving and construction vehicles than any previous piece of testing equipment. Designed and built by Firestone, the new dynamometer is more than twice the size of any similar type of measurement device and has a drawbar pull measurement capacity of 100,000 pounds, enough to test horsepower requirements of the largest units currently manufactured. Inaccurate job rating of equipment has long been the major cause of lost manhours in construction work. Until now the only method for testing new equipment has been by inaccurate dead weight and trial and error tests. The new dynamometer, it is claimed, accurately charts and permanently records drawbar pull and horsepower under all conditions. Because the machine also tests tractive ability of heavy-duty tires, it is useful in solving traction problems confronting heavy equipment manufacturers.

Track-type landing gears, which General George C. Kenney claims would have saved six months in the island-hopping air offensive against Japan, are now receiving serious consideration by most companies building large transport planes. Proved experimentally during the war, the endless rubber belt type of landing gear, nicknamed "flying runways," will permit large transport craft to land and take off at sod and dirt airstrips. A Firestone development, this new-type landing gear may replace conventional wheels and tires on most large aircraft in future designs. Listed advantages of the track-type landing gear are: (1) ability to operate from sand, dirt, and sod, sinking less than one-third as much as tires; (2) enables the heaviest planes to operate from existing runways by spreading load over approximately 250% greater runway surface; (3) eliminates bounce from hot landings; (4) virtually eliminates danger of ground loops; (5) reduces maintenance by eliminating blowouts and punctures and is less vulnerable to gun fire than tires; (6) compactness permits retraction into smaller wing or nacelle wells; (7) gives greater stability when striking ground obstacles; (8) gives more efficient breaking because of larger ground contact area, and better cooling of brakes because of better heat dissipation; and (9) shows less wear than a tire because it is cooler running. The gear was developed by Firestone as an endless belt of rubber reinforced with wire cord plies and grooved to fit into V-shaped bogey rollers.

Firestone recently received its third Award of Honor for Distinguished Service to Safety from the National Safety Council. J. E. Trainer, Firestone vice president in charge of production, received the award from William A. Irvin, chairman of the board of trustees of the Council, during the broadcast of the "Voice of Firestone" radio program on April 5. In making the presentation Mr. Irvin praised Firestone for its splendid overall

safety program during 1947 in 23 plants in 13 states and in Canada. Firestone's frequency rate for accidents in 1947 was 2.9 per million manhours worked; while latest Council figures available showed the national frequency average for accidents in the rubber industry to be 11.28 per million manhours and the United States all-industry average to be 14.16.

Firestone has appointed Interstate Engineering Corp. national manufacturer and sales representative for the Firestone airplane brake and wheel assembly used on small passenger and private planes, and Interstate is prepared to go into immediate production, according to John Koster, president.

Firestone Tire & Rubber on April 24 switched to a six-day work week.

Pharis Offers New Tire

The Pharis Tire & Rubber Co., Newark, in its recent annual report to stockholders announced that owing to the seasonal fluctuations of the tire business company directors hereafter will consider dividend action semi-annually rather than quarterly as in the past. The company also has taken steps to diversify the products it manufactures and sells, after completion of an improvement and expansion program last year. Among these new products are an improved type of radiator hose and several plastic items. The Pharis organization includes also the Molded Materials Division at Ridgeway, Pa., and the subsidiary, The Carlisle Tire & Rubber Co., Carlisle, Pa.

Pharis last month also announced the new Roadgripper, the first passenger-car tire to be guaranteed for 24 months in three ways in writing by the manufacturer. The announcement, made by Hynes Pitner, vice president in charge of sales, states that the guarantee covers replacement, time in service, and quality of performance. The tire is also said to incorporate 10 improvements over previous models, including automatic vise-grip tread action, straight-edge suction, snow-plow road cleaning action, and a deeper tread pattern. These qualities, it is said, give the tire an unusual amount of stability. The tire has a flatter contour which allows wider distribution of load over the tread surface. A new sidewall design which incorporates "bracket braces" together with the wider tread pattern combats side pressures that cause skidding. The tread stock has an added wear ingredient, and the sidewall is especially resilient to absorb shocks and bumps. The zigzag edges of the Roadgripper ribs vary in size. When brakes are applied, the weight of the car causes the ribs to close together and result in a vise-like grip on the road. Each tire sold carries a written guarantee for (1) free replacement within 90 days in family passenger service or 30 days in commercial passenger service for failures resulting from cuts, bruises, fabric ruptures, blowouts, rim cuts, or separations incurred under normal operating conditions; (2) time service guarantee for 24 months in family passenger service or eight months in commercial passenger service; and (3) a lifetime guarantee covering defects in workmanship and materials, both during and after the preceding guarantees, without limit as to time or mileage. The introduction of the new tire will be accompanied by a stimulated sales promotion program under the supervision of Ed L. Galleher that will feature a demonstration of the tire's tread action.

Three managerial changes in Pharis Service Stores were announced last month by J. N. Mullan, director of the Service Stores Division. Julius Sabo, formerly a salesman in the Newark store, has been named manager of that outlet; while Robert E. Arnold has been made manager of the store in Carlisle, Pa. Frank Moler becomes manager of the Columbus store, succeeding William S. Rowley, who will work directly under Mr. Mullan coordinating activities of the four Pharis Service Stores, located in Newark, Columbus, and Cincinnati, O., and Carlisle, Pa. These stores serve independent tire dealers in geographical areas in which they are located.

NEW ENGLAND

Howard Joins Canfield

The H. O. Canfield Co., Bridgeport, Conn., manufacturer of rubber products, has appointed Eliot W. Howard sales manager in charge of both the industrial and trade division sales, it was announced last month from the New York, N. Y., sales office, at 444 Madison Ave., by Charles W. Wyman, executive vice president of the company. Mr. Howard's previous position was sales manager of Firestone Rubber & Latex Products Co. and Firestone Industrial Products Co. He was with Firestone for the last eight years. Prior to that he had been with the Dewey & Almy Chemical Co., Cambridge, Mass. Mr. Howard is a graduate of Northeastern University and attended Massachusetts Institute of Technology Graduate School.

In announcing the appointment Mr. Wyman said: "With his extensive background in both sales and production of rubber items, Mr. Howard should prove of great service to H. O. Canfield customers in helping them both select and determine the exact rubber product most suitable to their needs. It is Mr. Howard's intention to set up an extensive customer service department, which will advise industrial and manufacturing companies precisely which product is best for their needs.

"The principal reason for setting up this department," continued Mr. Wyman, "is that in our opinion the era of preplanned manufacture is at hand. Even before a product has reached its final blueprint stage and tooling up has begun, the subcontractors of all component parts will play a larger and larger part. They will expedite the product's development by cooperation with the manufacturer right from the start in setting up the components for most advantageous and economical production of the finished job. That is what we plan to do at H. O. Canfield. That is why we feel that H. O. Canfield will prove of even greater service to its many industrial customers from coast to coast."

Lumar Products Co., 14 Sixth St., Bridgeport 7, Conn., manufacturer of toy balloons and rubber specialties, has opened a general sales office in New York, N. Y., at 62 William St. The office is under the supervision of the company's general sales manager, Milton R. Adler.

PACIFIC COAST

Voit Acquires Huntington

W. J. Voit Rubber Corp., 1600 E. 25th St., Los Angeles, Calif., last month celebrated its twenty-fifth anniversary by taking over the facilities of Huntington Rubber Co., 4010 Whiteside Rd., Los Angeles, as part of its expansion program to meet demand for Voit athletic products. In announcing the transaction, Page Parker, Voit vice president, stated that the acquisition of additional heavy equipment will enable Voit to expand its production to keep up with school and retailers' orders for the rubber-covered athletic balls developed by the late W. J. Voit, who founded the company in 1923 and developed the balls for which the company is so well known.

Then World War II channeled all Voit athletic equipment to the Armed Services. Unable to keep abreast of war demands, the company licensed its patents and research files to other concerns wishing to enter the field.

"These companies are still making rubber-covered equipment," reports Willard D. Voit, son of the founder and now president of the firm, "and the healthy competition resulting has helped us improve our products to the benefit of the general public."

During the war the company also made many molded rubber parts for airplanes.

Tire repair materials, the company's first product, are still a major item of Voit output, which with the acquisition of the Huntington Rubber Co., to be operated as the Huntington Rubber Division, will be expanded to include rubber floor tiling and garden hose.

D. T. Starr has received a building permit for construction of a rubber processing factory in Monrovia, Calif. The corrugated metal structure, to be 80 by 81 feet, will cost $12,062.

CANADA

GR-S Lignin Masterbatch

Culminating 18 months of research, Polymer Corp., Sarnia, Ont., has succeeded in producing GR-S lignin masterbatch on a pilot-plant scale and is now preparing quantities for commercial evaluation, it was announced by J. R. Nicholson, executive vice president. The work making possible this development in the use of lignin as a reinforcing agent was a joint effort of the research staffs of Polymer and Howard Smith Paper Mills, Ltd., Cornwall, Ont. In laboratory tests the new masterbatch shows promising possibilities. Tests seem to indicate that the lignin is capable of reinforcing GR-S to an extent comparable with that of the best grades of carbon black. By use of the masterbatch it is possible that high-strength GR-S compounds may be produced in light colors. The new development has great commercial significance in view of the potential availability of lignin and the increasing scarcity of high-quality carbon black.

Naugatuck Chemicals, division of Dominion Rubber Co., Ltd., Elmira, Ont., has appointed Alan R. Clark sales manager of rubber chemicals. Prior to joining Naugatuck, Mr. Clark had been associated with sales of chemicals to the rubber, paint, and chemical industries in the Toronto district for more than a decade.

OBITUARY

Frank G. Schenuit

A HEART attack caused the death, on March 30, of Frank G. Schenuit, president of The Frank G. Schenuit Rubber Co., which he had founded in 1912 in Baltimore, Md. The deceased was born there on November 18, 1896, and attended the local schools.

Mr. Schenuit was deeply interested in flying and obtained his first license in 1915. He also belonged to the Maryland Yacht, Gibson Island, and Maryland Flying clubs and the N. A. A.

Funeral services and burial took place in his native city on April 2.

He leaves his wife and three daughters.

L. N. Brennan

LAWRENCE N. BRENNAN, 53, assistant treasurer of United States Rubber Export Company, Ltd., died April 17 at the company's offices in Rockefeller Center, New York 20, N. Y. Mr. Brennan joined the organization in 1920 to do credit and collection work and later he became manager of the collections department. In 1936 he was promoted to assistant treasurer.

The deceased was born in Yonkers, N. Y., and educated in public schools there. He served overseas in World War I. Since then he has been active in war veterans affairs in Yonkers. He was a past commander of Post No. 7, American Legion, and of the General Committee of War Veterans Organizations and was formerly chairman of the Joint Veterans Relief Administration, Yonkers.

Surviving are his mother, his wife, a son, two daughters, and a sister.

Leslie B. Gordon

LESLIE B. GORDON, director of engineering for Dayton Rubber Co., Dayton, O., died suddenly of a heart attack in his home on April 8. Funeral services and burial took place April 10 in Cumberland, Md.

A graduate of Virginia Polytechnic Institute in 1912, with a degree in electrical and mechanical engineering, Mr. Gordon from 1923 until 1942 was director of engineering for Kelly-Springfield Tire Co., Cumberland. As vice president in charge of Navy production, the deceased next was with Patterson Foundry & Machine Co., from July, 1942, until August, 1943, when he became vice president in charge of Navy contracts for Herring-Hall-Marvin Safe Co. From there he went to Dayton Rubber on October 1, 1945. Mr. Gordon also served for a time as consulting engineer for Mansfield Tire & Rubber Co., Mansfield, O. His articles on technical subjects have appeared in many national technical journals.

He was a 32nd degree Mason, a member of Cleveland City Lodge 15, F&AM, Glenville Chapter 197, RAM, the Shrine in Cleveland, and the Scottish Rite in Dayton. He also belonged to the American Institute of Electrical Engineers, Southern Ohio Rubber Group, Dayton Foremen's Club, and the Mother Church of Christian Science in Boston, Mass.

Mr. Gordon was born in McAlester, Okla., in 1991.

Surviving are his wife and two brothers.

FINANCIAL

American Wringer Co., Inc., Woonsocket, R. I. For 1947: net profit, $949,504, equal to $3.43 a share, against $602,073, or $2.17 a share, a year earlier.

Anaconda Wire & Cable Co., New York, N. Y. For 1947: net income, $8,480,514, equal to $10.05 a common share, against $3,094,161, or $3.66 a share in 1946.

Borg-Warner Corp., Chicago, Ill., and subsidiaries. For 1947: net profit, $19,334,670, contrasted with $8,555,840 the year before; net sales, $258,388,981, against $138,864,344; income and excess profits taxes, $17,594,915 against $5,729,203; current assets, $116,190,905, against $82,893,617; current liabilities, $44,858,714, against $23,617,464.

First quarter, 1948: net profit, $6,762,202, equal to $2.82 a common share, against $4,684,481, or $1.93 a share, in the 1947 quarter; sales, $77,100,726, against $59,445,044.

Brunswick-Balke-Collender Co., Chicago, Ill., and subsidiaries. First three months, 1948: net profit, $62,406, equal to 6¢ each on 450,000 common shares, against $260,485, or 50¢ a share, in the like period last year; net sales, $5,305,711, against $6,086,638.

Crown Cork & Seal Co., Inc., Baltimore, Md., and wholly owned domestic subsidiaries. For 1947: net income, $4,178,317 (a new high), equal to $6.01 each on 603,895 common shares, contrasted with $3,090,206, or $4.21 a share, in 1946; sales, $81,438,684 (also a new high), against $62,230,851; federal income taxes $2,569,340, against $2,370,287.

The first three months of 1948: net income, $1,604,342, a record for any three-month period and equal to $1.21 a share, contrasted with $1,108,051, or 80¢ a common share, in the first quarter of 1947; sales, $23,089,958, against $16,828,643.

Eagle-Picher Co., Cincinnati, O., and subsidiaries. Quarter ended February 28, 1948: net profit, $651,918, equal to 73¢ a common share, contrasted with $1,249,628, or $1.40 a share, in the corresponding period last year; sales, $17,664,740, against $17,174,849.

The Dow Chemical Co., Midland, Mich., and subsidiaries. Nine months ended February 29, 1948: net profit, $14,025,192, equal to $2.47 each on 4,994,824 common shares, compared with $8,989,577, or $1.61 each on 1,248,706 common shares a year earlier; federal tax provisions, $8,810,348, against $5,772,015.

Flintkote Co., New York, N. Y., and subsidiaries. Twelve weeks ended March 27: net income, $1,560,708, equal to $1.24 each on 1,186,421 common shares, against $1,689,546, or $1.35 each on 1,183,921 shares, in the corresponding period last year; net sales, $17,541,370, against $15,090,757.

General Electric Co., Schenectady, N. Y. Quarter ended March 31: net profit, $25,389,149, equal to 88¢ a common share, against $17,918,591, or 62¢ a share, the year before; consolidated net sales, $365,957,990 against $260,780,643.

General Motors Corp., Detroit, Mich. For 1947: net profit, $287,991,373, equal to $6.24 a common share, against $87,526,311, or $1.76 a share, in 1946; net sales, $3,815,159,163, against $1,962,502,289.

Hewitt-Robins, Inc., Buffalo, N. Y. For 1947: net earnings, $1,223,618, equal to $4.39 each on 278,714 shares, compared with $471,452, or $1.70 a share, in the preceding 12 months; net sales, $21,609,351, against $15,426,415; federal income taxes, $817,372, against $222,078; provision for contingencies, $171,070, against $0; current assets, December 31, 1947, $9,135,520, including $2,344,662 cash, current liabilities, $3,038,032, against $8,239,634, $2,635,910, and $3,137,925, respectively, on December 31, 1946.

First quarter, 1948: net loss $108,092 (owing to a 10-week strike), contrasted with net profit of $373,569, or $1.34 a common share, in the 1947 quarter.

I. B. Kleinert Rubber Co., Inc., New York, N. Y. and subsidiaries. For 1947: net profit, $424,258, equal to $2.65 each on 159,814 capital shares, against $387,329, or $2.40 each on 161,563 shares, the year before.

Mansfield Tire & Rubber Co., Mansfield, O. For 1947: net income, $1,965,483, equal to $12.13 a common share, against $1,960,584, or $12.08 a share, in 1946; net sales, $40,499,826, against $35,286,340.

Minnesota Mining & Mfg. Co., St. Paul, Minn. For 1947: net profit, $11,598,376, equal to $5.94 each on 1,951,530 common shares, compared with $9,921,944, or $5.08 a share, in 1946; sales, $93,437,137 (a new high), against $75,169,623; income taxes, $6,070,000, against $6,310,000; current assets, year-end, $54,791,025, current liabilities, $13,565,955; respective figures, end of 1946, $33,409,789 and $11,293,110

Union Asbestos & Rubber Co., Chicago, Ill. For 1947: consolidated earnings, $1,223,418, equal to $2.47 each on 495,376 common shares, contrasted with $532,352 or $1.12 each on 475,376 shares, in 1946.

(Continued on page 292)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Patents and Trade Marks

APPLICATION

United States

2,436,889. **To Prevent Accumulation of Ice on Airfoils, an Apparatus Including a Covering of Rubber-Like Material Having a Multiplicity of Inflatable Tubular Passages, Each not Exceeding ¾-Inch in Diameter.** E. E. Heston, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,436,893. **Fluid-Driven Motorcycle of the Tandem Two-Wheel Type, Which Includes a Ground-Engaging Traction Wheel Having a Fluid Containing Housing Provided with a Peripheral Tire.** F. C. Lawson, Anderson, Ind.

2,436,953. **Shoe Cleaning Guard of Elastic Sheet Material.** H. Cronin, Cincinnati, O.

2,437,019. **For Collecting the Discharge Draining from a Body Incision, a Receptacle Held in Place by an Elastic Belt and Including a Removable Annular Soft Rubber-Like Tubular Sealing Member.** S. Eich, Chicago, Ill.

2,437,054. **Inflatable Orthopedic Shoulder Pad.** L. S. Tatai, Habana, Cuba.

2,437,065. **In Combination with a Shoe, a Removable Insole Including a Casing, and a Channeled Resilient Rubber Filler; This Insole Is Formed with Air Inlet and Outlet Ports.** S. B. Austin, Balboa, C. Z.

2,437,206. **Shock Absorbing Device.** E. P. Neher, North Manchester, Ind., assignor to General Tire & Rubber Co., Akron, O.

2,437,223. **In a Sportsman's Coat, a Waterproof Panel Pendently Attached to the Bottom of the Back and so Disposed That It Can Be Folded and Fastened Inside or Outside the Coat as Required.** C. H. Dutrow, Frederick, Md.

2,437,227. **Interposed between Inner and Outer Soles of a Shoe, a Cushioning Layer Including Coil Springs Molded within a Layer of Sponge Rubber and Facing Sheets of Hard Rubber Molded to Top and Bottom of the Sponge Rubber.** M. Hall, Akron, O.

2,437,342. **Textile Loom Picker of Rubberized Fabric Layers.** H. M. Bacon, Dayton, O., assignor to Dayton Rubber Co., Dayton, O.

2,437,362. **Top Spinning Roller for a Textile Machine, Including a Body of Acrylic Nitrile Butadiene Copolymer, in Which Are Dispersed Granulated, Water-Soluble Salt Crystals.** J. Rockoff, Dayton, O., assignor to Dayton Rubber Co., a corporation of O.

2,437,372. **Shock Absorbing Transfer Container Including a Dome to Which Is Attached a Skirt of Rubberized Material, and a Canvas Pouch Encircled by a Strap of Rubberized Duck.** H. W. Ballard, Merion, Pa., assignor to All American Aviation Inc., Wilmington, Del.

2,437,384. **For Directing Sand on to Railway Rails Adjacent the Wheels of Rolling Stock, a Sanding Nozzle Including a Hollow, Distensible Sanding Body of Rubber.** N. E. Gee, Narberth, Pa.

2,437,542. **Flexible Catheter-Type Instrument.** L. H. Krippendorf, White Plains, assignor to American Catheter Corp., Port Chester, both in N. Y.

2,437,583. **Hosiery Supporter.** E. J. Young, Jersey City, N. J.

2,437,602. **Multi-Section Inflatable Article.** K. G. Hann, Brean, Wales, assignor of one-half to Elliot Equipment, Ltd., Cardiff, England.

2,437,814. **For Sealing between Two Members Arranged One within the Other, Means Including a Sealing Ring of Flexible Resilient Material and an Axially Compressible, Radially Expansible Yieldable Backing Ring.** R. O. Hallen, Los Angeles, assignor to Lockheed Aircraft Corp., Burbank, both in Calif.

2,437,830. **In a Combination Girdle and Pantie, Leg-Encircling Elastic Bands Joined to the Lower Edge of a Side Panel.** A. S. McAllister, Morris, Minn.

2,437,843. **In a Joint between Telescopic Pipe or Rod Ends, Means for Sealingly Connecting the Ends, Including a Resilient Bushing of Rubber-Like Material.** H. E. Van Ness, Elmira, N. Y.

2,437,844. **In a Wheel Suspension for an Automobile, a Tubular Spring Formed of Deformable Material, and Rings of Rigid Material Bonded to the Ends of the Spring.** N. E. Wahlberg, Chicago, Ill., and G. V. Hedstrom, assignors to Nash-Kelvinator Corp., both of Kenosha, Wis.

2,437,900. **Liquid Seal Including a One-Piece, Centrally Apertured Molded Sealing Element of Rubber-Like Material.** T. H. Winkeljohn, Wabash, Ind., assignor to General Tire & Rubber Co., Akron, O.

2,437,901. **Sealing Ring for Insertion between Concentric Cylindrical Surfaces.** T. H. Winkeljohn, Wabash, Ind., assignor to General Tire & Rubber Co., Akron, O.

2,438,014. **Trick Walking Cane with a Hollow Stem in Which Are Two Tube Sections, One Communicating with a Squeeze Bulb at the Handle, and the Other Carrying an Intake Suction Valve Nipple at Its End.** B. V. Lukowitz, Milwaukee, Wis.

2,438,037. **Finger Tip Moistener for a Baseball Pitcher, Including a Rotatably Mounted Moistening Member of Resilient Material.** M. H. Chapman, Jr., Providence, R. I.

2,438,058. **Air Supply Device for Respirators.** D. N. Kincheloe, Quincy, Ill.

2,438,072. **Rubber Unitary Shoulder Pad.** J. M. Piccinni, Brooklyn, N. Y.

2,438,073. **Colostomy Irrigating Devices.** G. E. Saur, St. Louis, Mo.

2,438,142. **Air Cushion Pad for Gunstocks.** W. H. Brower, assignor of one-half to W. C. Brower, both of Clark, S. Dak.

2,438,195. **Pressure-Sensitive Adhesive Tape with a Backing Impregnated with a Non-Tacky Polyacrylate Elastomer and a Normally Tacky and Pressure-Sensitive Non-Offsetting Adhesive Coating Firmly United to the Backing.** H. J. Tierney, assignor to Minnesota Mining & Mfg. Co., both of St. Paul, Minn.

2,438,280. **Stocking Heel Protector Reinforced with Thin Flexible Plastic Material.** F. L. Gailey, Los Angeles, Calif.

2,438,296. **Rubber Covering for Takeup Rolls.** E. Nassimbene, assignor to Gates Rubber Co., both of Denver, Colo.

2,438,299. **Infant's Formula Can, Can Opener, and Nipple Attachment.** W. Relis, Lomita, Calif.

2,438,308. **Waterproof Hosiery Protector.** E. Wheaton, Detroit, Mich.

2,438,351. **In a Bladder, the Combination of a Hollow Body Having a Flexible Thermoplastic Resinous Side Wall, a Flexible Filling Nipple, and an Integral Flexible Annular Skirt Portion.** A. N. Spanel, Princeton, N. J.

2,438,364. **Bunion Protector to Which Is Attached a Tubular Member of Soft Elastic Material for Enclosing the Patient's Toe.** M. B. Goldbaum, Brooklyn, N. Y.

2,438,429. **Ventilated Rain Garment.** J. T. Callahan, West Newton, and J. A. Gilbertson, assignors to Archer Rubber Co., both of Milford, both in Mass.

Dominion of Canada

446,859. **Concentric Electrical Line Including a Central Conductor, an Air-Filled Tubular Deformable and Flexible Insulating Material Wrapped around the Conductor, and an Outer Sheath.** A. O. Ryan, River Edge, N. J., assignor to Federal Telephone & Radio Corp., New York, N. Y., U. S. A.

446,862. **Rubber-Articulated Joint.** J. H. Kelly, Jr., and R. M. Glassco, both of Wabash, Ind., assignors to General Tire & Rubber Co., Akron, O., both in the U. S. A.

446,984. **Magnetic Core of Powdered Magnetic Material Bonded together by a Polymerized Alcohol Ester of Carboxylic Acid.** A. F. Mittermaier, Fort Wayne, Ind., U. S. A., assignor to Canadian General Electric Co., Ltd., Toronto, Ont.

447,005. **Simulated Leather Consisting of a Fabric Backing, a Layer of Vulcanized Rubber Attached thereto, and over This Rubber Layer a Film Including Baked Lacquer and a Vulcanized Synthetic Rubber-Like Polymer.** D. E. Lovell, Mishawaka, Ind., U. S. A., assignor to Dominion Rubber Co., Ltd., Montreal, P. Q.

447,043. **Flexible Ashpalt Shingle Having a Band of Thermoplastic Sufficiently Adhesive to Seal down the Butt Portion of the Shingle to Its Underlying Surface.** L. Kirschbraun, La Canada, Calif. assignor to Patent & Licensing Corp., New York, N. Y., both in the U. S. A.

447,063. **Artificial Filamentary Material of Improved Creping Properties Having Dispersed throughout Its Mass a Polymerized Ethylene Oxide.** R. R. Sitzler and J. E. Bludworth, both of Cumberland, Md., assignors to C. Dreyfus, New York, N. Y., both in the U. S. A.

447,102. **In a Rinse Wringer, a Rinsing Chamber in Which Is Mounted a Conveyer Belt of Non-Rigid Material; This Belt Has Flexible Fingers Upstanding from Its Surface and Integral with It.** A. Schellenberg, New Lennox, Ill., U. S. A.

447,133. **Laminated Wrapping and Bagging Sheet Material Including Sheets of Paper, a Flexible Sheet of a Cellulose Derivative, Vinyl Resin or Casein, and Elastic Protective Coatings.** E. P. Fager, Winnetka, assignor to Dearborn Chemical Co., Chicago, both in Ill., U. S. A.

447,136. **Valve Packing of Solid Polymer of Ethylene.** G. L. Kellner, Kenmore, N. Y., U. S. A., assignor to Dominion Oxygen Co., Ltd., Toronto, Ont.

447,175. **Shrinkable Heat-Hardenable Container Closure Including a Prestretched Seamless Tubing Formed of a Thermoplastic Composition.** J. W. Little, Scarsdale, N. Y., assignor to Sylvania Industrial Corp., Fredericksburg, Va., assignor to American Viscose Corp., Philadelphia, Pa., all in the U. S. A.

447,188. **In a Receiver of Subaqueous Sound Waves Including an Electrical Pick-up Unit Suspended in a Frame Enclosed in a Container, Rubber-Like Damping Material between All Points of Bearing between Frame and Interior of the Container, which Has Laminated Walls of Metal Overlaid with a Thicker Layer of Resilient Material Having the Wave Propagating Properties of Flexible Rubber.** W. R. Harry and F. F. Romanow, both of Summit, N. J., assignors to Bell Telephone Laboratories, Inc., assignor to Western Electric Co., Inc., both of New York, N. Y., both in the U. S. A.

447,237. **Pliable Interlayer Embossed Sheeting Including a Polyvinyl Butyral Resin and a Plasticizer therefor.** P. W. Crane, Upper Montclair, N. J., U. S. A., assignor to Canadian Industries Ltd., Montreal, P. Q.

447,273. **Nursing Unit.** A. M. Allen, Arlington, Va., assignor to Disposable Bottle Corp., Washington, D. C., both in the U. S. A.

447,305. **Sandblast Stencil of Laminated Sheet Material Including a Rubber Backing.** A. J. Wartha, assignor to Minnesota Mining & Mfg. Co., both of St. Paul, Minn., U. S. A.

United Kingdom

597,181. **Pressure-Sensitive Adhesives.** Johnson & Johnson (Great Britain), Ltd.

597,215. **Hose and Fittings.** Weatherhead Co.

597,284. **Elastic Railway Car Wheels.** Allmanna Svenske Electriska A.B.

597,327. **Pressure-Sensitive Adhesive Tapes of Sheets with Woven Glass Fabric Backing.** Johnson & Johnson (Great Britain), Ltd.

597,473. **Cables.** Pirelli-General Cable Works, Ltd., B. O. Ashford, and R. E. Horley.

597,555. **Wedge Belt.** Wingfoot Corp.

597,786. **Package.** Wingfoot Corp.

597,881. **Resilient Bearing Bushes.** H. Clayton-Wright.

597,891. **Knitted Fabrics with Elastic Selvage.** Scott & Williams, Inc.

597,957. **Super-Tension Cables.** W. C. Bexon.

598,030. **Sound-Insulating Device for Human Head.** H. N. G. Gobbe.

598,247. **Inflatable Pneumatic Articles.** E. A. Pask.

598,292. **Belt Drives.** Usines Tornos Fabrique de Machines Moutier, S. A., J. Mancia, and G. Megel.

598,324. **Shaft Sealing Means.** Simplex Products Corp.

598,456. **Pressure-Sensitive Adhesives.** Johnson & Johnson (Great Britain), Ltd.

598,542. **Waste Plugs for Sinks, Etc.** H. G. W. Chichester-Miles.

598,584. **Sealing Means for Universal Joints.** Bendix Aviation Corp.

PROCESS

United States

2,437,030. **Attaching Rubber Soles to Shoe Uppers.** J. Hoza, Belcamp, Md.

2,437,855. **Veneering Elastomers.** E. E. Leach, Jr., Norristown, Pa., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,437,873. **Tires.** C. L. Beward, assignor to General Tire & Rubber Co., both of Akron, O.

2,438,281. **Rolling an Ignitable Colloidable Material.** S. Gordon, Madison, Wis., assignor, by mesne assignments, to The United States of America, as represented by the Secretary of War.

Dominion of Canada

446,890. **Diaphragms from a Synthetic Organic Polymer Solution.** F. V. Sander, Highland Park, and C. H. Coles, North Plainfield, both in N. J., U. S. A., assignors to Ortho Pharmaceutical Corp. (Canada) Ltd., Toronto, Ont.

447,007. **Plies of Strain Resisting Elements for a Pneumatic Tire Carcass.** G. R. Cuthbertson, R. R. Miller and E. B. Dodge, all of Detroit, Mich., U. S. A., assignors to Dominion Rubber Co., Ltd., Montreal, P. Q.

447,180. **Molding Thin-Walled Cylindrical Hollow Members from a Film-Forming Material.** H. Reichard, Twickenham, Middlesex, assignor to Vinyl Products, Ltd., Carshalton, Surrey, both in England.

447,227. **Covering a Wire with Thermoplastic Material by Extrusion.** H. M. Steward and H. R. F. Carsten, both of Liverpool, R. Blackburn, St. Helen's, and J. L. Packer,

Roby, assignors to British Insulated Cables Ltd., Prescott, assignor to British Insulated Callender's Cables Ltd., in Liquidation, by D. McKellar, Liquidator, London, all in England.

447,241. **Improving the Physical Properties of Organic Diisocyanate Modified Polyesters and Polyesteramines by Mechanically Working the Compounds While in Plastic Condition.** D. A. Harper, Blackley, Manchester, England, assignor to Canadian Industries, Ltd., Montreal, P. Q.

United Kingdom

597,372. **Treatment of Thermoplastic Sheet Material.** Bakelite, Ltd.

597,666. **Joining Thermoplastic Materials by Electromagnetic Induction.** A. Benn and H. G. Allen.

597,703. **Forming a Sphygmomanometer Cuff, Inflatable Tourniquet, or the Like.** W. A. Baum Co., Inc.

597,909. **Impregnating Fabrics and the Like.** C. J. Healey.

598,338. **Rubber Products.** Firestone Tire & Rubber Co., Ltd., and M. M. Heywood.

598,547. **Vulcanizing Rubber Soles to Footwear.** P. C. Oxborrow.

598,637. **Metal Covered Plastic Articles.** L. Rado.

CHEMICAL

United States

2,436,841. **Testing Method for Polystyrene Including Dissolving a Solid Polymer of Styrene in Propylene Oxide and Adding Methanol to Precipitate the Polystyrene.** A. J. Warner, South Orange, N. J., assignor to Federal Telephone & Radio Corp., New York.

2,436,842. **Insulating Material Containing Substantially Pure Cyclized Rubber Hydrocarbon, Polyisobutylene, and a Polystyrene.** A. J. Warner, South Orange, and M. Bakst, assignors to Federal Telephone & Radio Corp., both of Newark, both in N. J.

2,436,885. **Resilient Corona Resistant Dielectric for High-Tension Cables, Including Polymerized Chloroprene, Polymerized Trimethyl Dihydroquinoline, Diphenyl Ethylene Diamine, and a Wax from the Methane Series.** L. P. Gould and J. W. Whiteside, both of Dayton, O., assignors to General Motors Corp., Detroit, Mich.

2,436,926. **Polymerization of a Member of the Group of Acrylic Acid Nitrile and a Mixture of Acrylic Acid Nitrile together with a Minor Proportion of Another Copolymerizable Unsaturated Compound, to Obtain a Dimethyl Formamide-Soluble Polymer.** R. A. Jacobson, Landenburg, Pa., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,437,046. **Stabilization of Polyesters.** D. A. Rothrock, Jr., and R. F. Conyne, assignors to Resinous Products & Chemical Co., all of Philadelphia, Pa.

2,437,148. **Preparation of a Vinyl Fluoride by Subjecting in the Vapor Phase an Acetylenic Hydrocarbon in Admixture with Hydrogen Fluoride to Contact with a Catalytic Composition Consisting of Mercury Oxide Partially Combined Chemically with an Oxide on Nitrogen Supported on a Water-Insoluble Alkaline Earth Metal Salt as a Carrier.** A. L. Barney, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,437,204. **Sulfuric Acid Polymerization of Diorganosiloxanes.** R. R. McGregor, Verona, and E. L. Warrick, Pittsburgh, both in Pa., assignors to Corning Glass Works, Corning, N. Y.

2,437,231. **Copolymers of Styrene and a Beta-Cyanoacrylate.** D. T. Mowry, Dayton, O., assignor to Monsanto Chemical Co., a corporation of Del.

2,437,232. **Stabilization of Polyesters from Dihydric Alcohols and Both Saturated and Unsaturated Dicarboxylic Acids.** D. A. Rothrock, Jr., and R. F. Conyne, assignors to Resinous Products & Chemical Co., all in Philadelphia, Pa.

2,437,258. **The Isoprene Ester of an Acid from the Group of Plant Hormone Acids.** F. D. Jones, Llanerch, assignor to American Chemical Paint Co., Ambler, both in Pa.

2,437,277. **Preparation of Erythritol by Hydrolyzing a Dichloro Diacetate of Butadiene in the Presence of an Aqueous Solution of a Weak Alkali.** F. J. Soday, Baton Rouge, La., assignor to United Gas Improvement Co., a corporation of Pa.

2,437,278. **Resinous Polymer from Methyl Indene.** F. J. Soday, Baton Rouge, La., assignor to United Gas Improvement Co.

2,437,284. **Resilient Rubber-Substitute Composition from a Highly Plasticized Phenol-Aldehyde Resin Mixed with a Polyvinyl Resin.** B. W. Watson, Trenton, N. J.

2,437,293. **Aqueous Emulsion Including a Copolymerization Product of a Dyring Oil with an Ester Obtained by Reacting a Cyclopentadiene-Maleic Adduct, a Fatty Acid, and a Polydhyric Alcohol.** W. H. Butler, Bloomfield, N. J., assignor to Bakelite Corp., a corporation of N. J.

2,437,308. **In the Process of Obtaining 2-Fluoro-1,3-Butadiene, the Step of Passing a Mixture of Monovinylacetylene and Hydrogen Fluoride over Charcoal Impregnated with Mercuric Oxide and Coated with Basic Mercuric Nitrate.** L. F. Salisbury, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,437,420. **Vulcanizable Copolymers of a Vinyl Aryl Compound, Butadiene, and Vinyl Ethers.** G. F. D'Alelio, assignor to Pro-phy-lac-tic Brush Co., both of Northampton, Mass.

2,437,421. **Vulcanizable Copolymers of Acrylonitrile, Butadiene, and Vinyl Ethers.** G. F. D'Alelio, assignor to Pro-phy-lac-tic Brush Co., both of Northampton, Mass.

2,437,501. **Stabilizing Methyl-Substituted Polysiloxanes, by Incorporating Ketene.** C. A. Burkhard, Alplaus, and W. I. Patnode, Schenectady, both in N. Y., assignors to General Electric Co., a corporation of N. Y.

2,437,508. **Copolymers of Mixtures Including Allyl and Methallyl Ether Esters.** G. F. D'Alelio, Northampton, Mass., assignor to General Electric Co., a corporation of N. Y.

2,437,538. **Composition Including Reclaimed Vulcanized Natural Rubber, Octadecane Nitrile, Sulfur, Triphenyl Guanidine, and a Butadiene-Acrylonitrile Rubber.** J. H. Kelly, Oak Park, assignor to Dryden Rubber Co., Chicago, both in Ill.

2,437,657. **Resinous Butylated Urea-Formaldehyde Condensation Product.** H. J. West and H. M. Enterline, both of Stamford, Conn., assignors to American Cyanamid Co., New York, N. Y.

2,437,708. **In a High-Tension Insulated Electric Cable Including a High-Tension Conductor, and a Layer of Oil-Impregnated Insulation therearound, an Oil-Impervious Organic Electric Shielding Layer over the Insulation and Including 0.25-Part to Four Parts of an Alcohol-Soluble Synthetic Linear Polyamide to One Part of a Carbon Black Having a Resistance of Less Than One Ohm per One-Inch Cube.** C. E. Plass, Worcester, Mass., and D. J. Sullivan, Fairfield, Conn., said Sullivan assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and said Plass assignor to American Steel & Wire Co. of New Jersey, a corporation of N. J.

2,437,710. **Production of Resins from a Methylol Monohydric Phenol and a Polyhydric Phenol.** P. H. Rhodes, Portland, Me., assignor, by mesne assignments, to Koppers Co., Inc., a corporation of Del.

2,437,857. **Water-Soluble Unsaturated Trihydric Terpene Alcohol.** D. A. Lister, Brunswick, Ga., assignor to Hercules Powder Co., Wilmington, Del.

2,437,925. **Rubber Extenders from Linseed Oil.** L. Auer, South Orange, assignor to Ridbo Laboratories, Inc., Paterson, both in N. J.

2,437,946. **Coating Composition Including Prolamine Plasticized with N-Butyl Lactamide.** C. D. Evans, Peoria, Ill., and R. H. Manley, St. Paul, Minn., assignors to United States of America, as represented by the Secretary of Agriculture.

2,437,955. **Molding Compounds Including Furfuryl Alcohol Reaction Products.** H. I. Hersh, Toledo, O., assignor to Owens-Illinois Glass Co., a corporation of O.

2,437,962. **Clear Colorless Resin Which Is a Copolymer of a Mixture of a Polyester of Allyl Alcohol with a Polybasic Acid and a Polyester of a Saturated Monohydric Alcohol and an Alpha-Beta-Unsaturated Polycarboxylic Acid.** E. L. Kropa, Old Greenwich, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,437,966. **Interpolymer of Styrene and Fumarodinitrile Plasticized with an Alkyl Phthalyl Alkyl Glycollate.** D. T. Mowry, Dayton, O., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,437,980. **Chlorobenzalacetone Copolymer.** R. B. Seymour and D. T. Mowry, both of Dayton, O., assignors to Monsanto Chemical Co., St. Louis, Mo.

2,437,981. **Improved Water-Soluble Phenolic Adhesive for Making Hot Press Plywood.** J. T. Stephan, P. A. Jary, and J. R. Ash., assignors, by mesne assignments to Monsanto Chemical Co., all of Seattle, Wash.

2,437,998. **Beta-Halogenated Unsaturated Nitriles.** A. M. Clifford and J. G. Lichty, both of Stow, assignors to Wingfoot Corp., Akron, both in O.

2,438,019. **Fumaric Nitrile.** H. A. Pace.

2,438,020. **Ethylene-Polyhaloethylene Re-**

2,438,021. **Ethylene-Polyhaloethylene Reaction Products.** J. R. Roland, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,438,041. **Producing Styrene from Butadiene.** H. A. Dutcher, Borger, Tex., assignor to Phillips Petroleum Co., a corporation of Del.

2,438,090. **Alpha, Beta Dimethoxy Propionitrile.** A. M. Clifford, Stow, and J. G. Lichty, Cuyahoga Falls, assignors to Wingfoot Corp., Akron, all in O.

2,438,097. **Thermoset Composition from Vinyl Chloride-Vinylidene Chloride Copolymer Which Includes a Quaternary Ammonium Compound.** T. H. Rogers, Jr., and R. D. Vickers, assignors to Wingfoot Corp., all of Akron, O.

2,438,102. **Vinyl Halide Resin Which Will not Discolor on Heating and Includes a Compound from the Group of Magnesium Salicylate and Alkaline Earth Metal Salicylates.** F. W. Cox, Cuyahoga Falls, and J. M. Wallace, Jr., assignors to Wingfoot Corp., both of Akron, both in O.

2,438,176. **Gasproof Composite Fabrics, Including Layers of Fabric to which Is Applied an Aqueous Solution Containing a Substance from the Group of Polyvinyl Alcohol and Water-Soluble Partial Polyvinyl Alcohols, an Acid Catalyst and Aldehyde to Insolubilize the Alcohol.** L. A. Lantz and A. Schofield, assignors to Calico Printers' Assn., Ltd., all of Manchester, England.

2,438,315. **Dehydrogenation of 2,3-Dimethylbutane to Obtain 2,3-Dimethylbutadiene-1,3.** F. E. Frey, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,438,340. **Polymerization of a Mixture of Hydrocarbons Including Isobutylene, Butadiene, and Styrene, at—40° C., with a Previously Prepared Solution of Aluminum Bromide Dissolved in a Saturated Hydrocarbon Liquid as Catalyst.** H. L. Johnson, Norwood, assignor to Sun Oil Co., Philadelphia, both in Pa.

2,438,366. **Treatment of Tire Fabrics by Impregnating with an Aqueous Dispersion of Rubber Hydrocarbons and Phenolic Resin Forming Reagents and Subjecting the Fabric for a Fraction of a Second to Dry Steam at Atmospheric Pressure and at about 140° C.** J. W. Illingworth, Little Aston, assignor to Dunlop Rubber Co., Ltd., London, both in England.

2,438,464. **Producing Butadiene from Vaporized Ethanol and a Member of the Group of Acetaldehyde, Crotonaldehyde and Acetaldol.** LeR. U. Spence, Elkins Park, and D. J. Butterbaugh and D. G. Kundiger, assignors to Rohm & Haas Co., all of Philadelphia, both in Pa.

2,438,478. **Polymer of Dimethyl Silicone Having the Formula $[(CH_3)_2\ SiO]_n$ Where $_n$ Is an Integer from 3 to 4 Inclusive.** J. F. Hyde, assignor to Corning Glass Works, both of Corning, N. Y.

2,438,480. **Destroying Peroxide-Containing Catalyst Residues in Alcohol-Insoluble Vinyl Halide and Vinylidene Halide Polymers.** G. W. Stanton, assignor to Dow Chemical Co., both of Midland, Mich.

Dominion of Canada

446,823. **Dissolving a Partially Demethylated Ether of Dimethylol Urea in an Alkyd Resin by Heating until a Homogeneous Blend Soluble in Aromatic Hydrocarbons Is Formed.** H. J. West, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y., both in the U. S. A.

446,863. **Accelerating the Polymerization of a Mixture of Butadiene-1,3 and a Vinyl Compound with the Aid of a Catalyst Including a Water-Soluble Heavy Metal Salt Combined with a Derivative of a Phosphorous Oxyacid.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U. S. A.

446,959. **Vinyl Resin Composition Plasticized with a Mixture of Dioctyl Alkenyl Succinates.** L. T. Sutherland, Yonkers, assignor to Allied Chemical & Dye Corp., New York, both in N. Y., U. S. A.

446,963. **Treating a Cellulosic Textile Material with a Water-Insoluble Methylated Methylol-Melamine.** H. W. Stiegler, Falls Church, Va., and L. A. Fluck, Jr., South Norwalk, Conn., assignors to American Cyanamid Co., New York, N. Y., all in the U. S. A.

446,981. **Resinous Reaction Product of an Aldehyde and a Triazine Derivative.** G. F. D'Alelio and J. W. Underwood, both of Pittsfield, Mass., U. S. A., assignors to Canadian General Electric Co., Ltd., Toronto, Ont.

447,014. **Improving the Adhesion of Rayon Yarns and Rubber Compositions by Incorporating in the Viscose from Which the Rayon Yarn Is Formed, Components Capable of Reacting in an Alkaline Solution to Form Heat-Hardening Aldehyde.** J. W. Illingworth and E. W. Madge, both of Birmingham, England, assignors to Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

447,028. **Shaped Article Including the Direct Deposit of Solids of an Aqueous Dispersion of a Butadiene-Styrene Copolymer Containing Separately Polymerized Thermoplastic Polyterpene.** C. R. Peaker, Union City, Conn., U. S. A., assignor to International Latex Processes, Ltd., London, England.

447,049. **Composition Including a Natural or Synthetic Rubber and, as Modifier, a Linear Polyester of Sebacic Acid and 1,3-Propylene Glycol.** R. F. Conyne, Philadelphia, Pa., and

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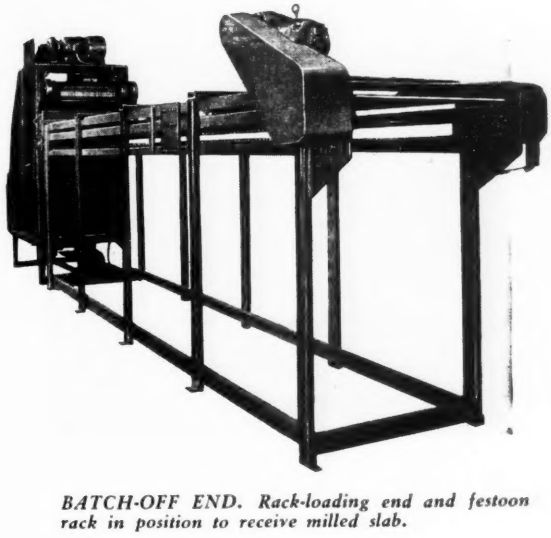

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F. G. Felske, Wynnewood, Pa., assignors to Resinous Products & Chemical Co., Philadelphia, Pa., U. S. A.

447,068. **Bonding Textile Fabrics to Rubber by Vulcanizing Rubber in Contact with a Fabric Bearing a Deposit of a Bonding Metal Consisting of an Alloy of Copper and Zinc.** G. M. Hamilton and C. T. Suchy, both of London, England.

447,117. **Condensation Product of Mercaptobenzothiazole, Cyanamide, and Formaldehyde.** A. R. Davis, Riverside, Conn., assignor to American Cyanamid Co., New York, N. Y., both in the U. S. A.

447,118. **Plasticizing Chloroprene Polymers by Incorporating a Salt of a Dialkyldithiophosphoric Acid and a Salt-Forming Organic Base.** A. R. Davis, Riverside, Conn., assignor to American Cyanamid Co., New York, N. Y., both in the U. S. A.

447,119. **Preparing Melamine from Cyanourea.** J. H. Paden, Stamford, and J. S. Mackay, Greenwich, both in Conn., assignors to American Cyanamid Co., New York, N. Y., both in the U. S. A.

447,148. **Heat-Convertible Molding Composition from a One-Stage Phenol-Formaldehyde Resinous Product Syrupy at Room Temperature.** W. H. Adams, Jr., assignor to Haveg Corp., both of Newark, Del., U. S. A.

447,157. **Rubber Composition Stabilized against Oxidation by Incorporating a Natural Antioxidant Extracted from Crude Vegetable or Fish Oils with the Aid of Isopropanol.** L. O. Buston, Newark, assignor to National Oil Products Co., Harrison, both in N. J., U. S. A.

447,230. **Resinous Composition Including the Reaction Product of Aldehyde and Triazine Derivative.** G. F. D'Alelio, Northampton, Mass., U. S. A., assignor to Canadian General Electric Co., Ltd., Toronto, Ont.

447,235. **Rubber Composition Including a Reinforcing Channel Black and an Accelerator from the Group of 2-Mercaptothiazoline and Substituted 2-Mercaptothiazolines in Which the Substituents Are Selected from Alkyl and Hydroxyalkyl Groups Bonded to the Ring Carbon Atoms of the Thiazoline Ring.** A. M. Neal, Wilmington, Del., and B. M. Sturgis, Pitman, N. J., both in the U. S. A., assignors to Canadian Industries, Ltd., Montreal, P. Q.

447,236. **Rubber Composition Including a Semi-Reinforcing Carbon Black and, as Accelerator, 4-Methyl-2-Mercaptothiazoline.** A. M. Neal, Wilmington, Del., U. S. A., assignor to Canadian Industries, Ltd., Montreal, P. Q.

447,239. **Resinous Composition Including the Reaction Products Obtained by Heating Simultaneously Primarily Diamine-Dicarboxylic Salt, a Monohydric Alcohol, Formaldehyde and Urea, Guanidine or Amino Triazine.** D. E. Edgar, Philadelphia, Pa., U. S. A., assignor to Canadian Industries, Ltd., Montreal, P. Q.

447,243. **Polyvinyl Alcohol Composition Including a Clay Substantially Identical with Chicora No. 3.** C. J. Krister, Wilmington, Del., and H. J. Sedusky and G. L. Thompson, both of Cleveland, O., both in the U. S. A., assignors to Canadian Industries Ltd., Montreal, P. Q.

447,244. **Plastic Composition Including an Organic Polymeric Binder, as Vinyl Resin, and a Finely Divided Inert Organic Material, as Walnut Shell Flour or Ground Redwood Flour.** C. W. Johnson, New Brunswick, N. J., U. S. A., assignor to Canadian Industries, Ltd., Montreal, P. Q.

447,245. **2-Alkoxymethylmercaptothiazolines.** W. J. Burke, Marshalltown, Del., U. S. A., assignor to Canadian Industries, Ltd., Montreal, P. Q.

447,246. **In the Process for Preparing Processing Agents for Butadiene-Styrene Elastomers, the Step of Intimately Mixing in a Butadiene-Styrene Elastomer a Compound of the Group of Para-Nitrosodimethylaniline, Nitroso-Beta-Naphthol, Phenylhydrazine, Benzoyl Peroxide and Thio-Alpha-Naphthol, and Exposing the Mixture to Oxygen.** J. R. Vincent, Wilmington, Del., U. S. A., assignor to Canadian Industries, Ltd., Montreal, P. Q.

447,283. **In the Addition Polymerization of Unsaturated Organic Compounds, the Use of a Catalyst Including a Water-Soluble Heavy Metal Salt Combined with an Aliphatic Organic Compound Containing One to Two Divalent Sulphur Atoms.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U. S. A.

447,284. **Polymerizing an Aqueous Emulsion of Butadiene in the Presence o. a Compound Containing the 2-Thiothiazyl Group.** C. F. Fryling, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U. S. A.

447,292. **Plastic Composition Including Ethyl Cellulose and a Phenol Having a Carbon Linkage Para Substituent and an Oxygen Linkage Ortho Substituent as a Stabilizer therefor.** W. W. Koch, assignor to Hercules Powder Co., both of Wilmington, Del., U. S. A.

447,295. **Liquid Fuel Container Including Two or More Layers of Material Bonded together with a Cement Consisting of a Solution of a Polyvinyl Acetal Resin together with a Soluble Phenol-Formaldehyde Condensation Product** B. J. Balfe, Stowmarket, assignor to Imperial Chemical Industries, Ltd., London, both in England.

447,322. **Polymerizing Ethylene by Subjecting It to the Action of Reduced Cobalt Deposited on Activated Carbon.** J. Anderson and W. H. Peterson, both of Berkeley, and S. H. McAllister, Lafayette, assignors to Shell Development Co., San Francisco, all in Calif., U. S. A.

United Kingdom

597,178. **Alkylchloro Polysiloxanes.** British Thomson-Houston Co., Ltd.

597,191. **Cold Hardening Compositions from Urea-Formaldehyde Syrups.** Semtex Ltd., F. G. Mottershaw, and G. J. L. Griffin.

597,218. **Resinous Electrically Insulating Compositions.** Westinghouse Electric International Co.

597,253. **Poly-Amino Compounds.** J. G. N. Drewitt and M. B. Green.

597,285. **Synthetic Resin-Modified N-Alkoxymethyl Polyamide Compositions.** E. I. du Pont de Nemours & Co., Inc.

597,326. **Treatment of Polymeric Materials.** Imperial Chemical Industries, Ltd., D. A. Harper, and R. J. W. Reynolds.

597,342. **Adhesive Compositions or Adhesive Bonding of Surfaces.** B. B. Chemical Co., Ltd. (B. B. Chemical Co.).

597,366. **Chlorofluorosilanes.** E. I. du Pont de Nemours & Co., Inc., J. W. Hill, R. V. Lindsey, Jr., and R. H. Wiley.

597,367 **Organosilicon Halides.** Imperial Chemical Industries, Ltd.

597,368. **Polymers and Copolymers of Acrylonitrile.** Imperial Chemical Industries, Ltd.

597,417. **Film-Forming Compositions.** Wingfoot Corp.

597,446. **Organic Compounds Containing Sulfur.** Ilford, Ltd., J. D. Kendall, and H. D. Edwards.

597,512. **Molding Powders and Plastic Masses.** W. Walker & Sons, Ltd., J. R. Alexander, D. Burton, and F. Hausman.

597,553. **Modified Butadiene-Styrene Copolymers.** Wingfoot Corp.

597,590. **Resinous Condensation Products.** Beck, Koller & Co., (England), Ltd., E. A. Bevan, and R. S. Robinson.

597,643. **Polymerization of Olefinic Hydrocarbons.** C. Arnold (Standard Oil Development Co.).

597,712. **Synthetic Resinous Condensation Products.** British Thomson-Houston Co., Ltd.

597,726. **Granular Amine-Aldehyde Molding Composition.** L. Smidth.

597,783. **Rubber-Like Substances.** J. R. Whinfield and W. K. Birtwistle.

597,833. **Polymerization Products of Ethylene.** E. I. du Pont de Nemours & Co., Inc.

597,834. **Polysiloxane Resins.** British Thomson-Houston Co., Ltd.

597,993. **Beta-Trichloroethane.** E. I. du Pont de Nemours & Co., Inc.

598,023. **Compositions for Use in the Adhesive Bonding of Surfaces.** B. B. Chemical Co., Ltd., L. E. Puddefoot, and A. M. Hall.

598,055. **Plastic Compositions.** H. E. Potts (Shawinigan Chemicals, Ltd.).

598,069. **Nuclear Substituted Dimethyl Styrenes.** Dominion Tar & Chemical Co., Ltd.

598,099-100. **Heat Resistant Insulating Materials.** Corning Glass Works.

598,140. **Aqueous Dispersions of Synthetic Resins.** Dispersions Process, Inc.

598,180. **Waterproof Fibrous Coating Compositions.** J. C. Arnold (Standard Oil Development Co.).

598,257. **Vinyl Resin Suspensions.** Carbide & Carbon Chemicals Corp.

598,322. **Stabilization of Synthetic Rubber Latices.** C. Arnold (Standard Oil Development Co.).

598,323. **Polymerization of Olefins.** C. Arnold (Standard Oil Development Co.).

598,354. **Recovery of Thermoplastic Resins from Solutions thereof** British Resin Products, Ltd., and W. G. Daroux.

598,416. **Rubber-Like Substances.** J. R. Whinfield and W. K. Birtwistle.

598,464. **Fibers of Ethylene Polymer.** E. I. du pont de Nemours & Co., Inc.

598,506. **Resin Emulsions.** Distillers Co., Ltd., J. J. P. Staudinger, and D. Cleverdon.

598,558. **Polymerization of Dimethyl Styrenes.** Dominion Tar & Chemical Co., Ltd.

598,562. **Plastics from Alginates.** Alginate Industries, Ltd., and E. G. Millatt.

598,602. **Copolymer Resins.** P. H. Rhodes.

598,642. **Cellular Phenol-Aldehyde Resins.** British Thomson-Houston Co., Ltd.

MACHINERY

United States

2,436,993. **Apparatus to Mold Material Which Becomes Plastic When Heated.** J. R. Fisher, Jr., Dayton, O., assignor to H-P-M-Development Corp., Wilmington, Del.

2,436,999. **Apparatus for Injection-Molding of Plastics, Including Means for Producing a High-Frequency Zone.** H. F. MacMillin, W. Ernst, and G. A. Waldie, all of Mount Gilead, O., assignors to H. P. M. Development Corp., Wilmington, Del.

2,437,109. **Dipping Machine.** L. E. Maquat, Easton, assignor to Black Rock Mfg. Co., Bridgeport, both in Conn.

2,437,512. **Tire Mounting Apparatus.** I. J. Ekse, Minneapolis, Minn.

2,437,685-687. **Apparatus and Process for the Melt Extrusion of Thermoplastic Materials.** H. Dreyfus, London, England C. Bonard, administrator of H. Dreyfus, deceased, assignor to Celanese Corp. of America, a corporation of Del.

2,438,003. **Closure in a Continuous Extrusion and Vulcanization Apparatus.** K. C. Edwards, Chase, and D. D. Jones, Towson, both in Md., assignors to Western Electric Co., Inc., New York, N. Y.

United Kingdom

597,211. **Presses for Molding Tires.** Dunlop Rubber Co., Ltd., and T. Norcross.

597,214. **Polymerization Apparatus.** International Polaroid Corp.

597,373. **Apparatus to Treat Thermoplastic Sheet.** Bakelite, Ltd.

597,638. **Extruder for Powdered Materials.** British Thomson-Houston Co., Ltd.

597,728. **Apparatus to Coat or Impregnate Threads with Synthetic Resins.** J. A. Lodge.

597,737. **Device for Rapid Braking or Reversal of Calenders for Rubber.** Allmänna Svenska Elektriska A. B.

597,997. **Apparatus for Injection Molding Thermoplastic Materials.** Thurgar Bolle, Ltd. (A. Cretin).

Dominion of Canada

446,014. **Apparatus for Making Retractile Cord Embodying a Vulcanizable Material.** R. D. Collins, Beverly Hills, Calif., assignor of one-half the interest to Kellogg Switchboard & Supply Co., Chicago, Ill., both in the U. S. A.

446,978. **Discharge or Delivery Head for**

Plastic Extruder. J. Brown, assignor to David Bridge & Co., Ltd., both of Rochdale, Lancashire, England.

447,008. **Apparatus and Method for Manufacturing Inner Tubes.** D. J. Hinman, Indianapolis, Ind., U. S. A., assignor to Dominion Rubber Co., Ltd., Montreal, P. Q.

447,013. **Tire Repairing Apparatus.** T. Norcross, Birmingham, assignor to Dunlop Rubber Co., Ltd., London, both in England.

447,204. **Tire Retreading Mold.** P. E. Hawkinson, Minneapolis, Minn., U. S. A.

447,240. **Apparatus for Polymerizing an Ethenoid Monomer.** B. M. Marks, Upper Montclair, N. J., U. S. A., assignor to Canadian Industries, Ltd., Montreal, P. Q.

447,285. **Molding Apparatus.** O. E. Hermanns, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U. S. A.

TRADE MARKS

United States

436,729. **Sirocco.** Tires. Arnold, Schwinn & Co., Chicago, Ill.

436,735. **Tornado.** Tires. Arnold, Schwinn & Co., Chicago, Ill.

436,781. Representation of a circle broken by the words: **"Edgerton Pli-Flex."** Footwear. Nunn-Bush Shoe Co., Milwaukee, Wis.

436,787. **AnneRowe.** Raincoats. Affiliated Retailers, Inc., New York, N. Y.

436,816. Representation of a cup and the words: **"Gold Cup."** Lubricating oil. Dunlop Tire & Rubber Corp., Buffalo, N. Y.

436,825. **Flame Buster.** Shut-off nozzle for fire hose. Grinnell Co., Inc., Providence, R. I.

436,839. **Genecaprene.** Wires and cables. General Cable Corp., New York, N. Y.

436,875. **Tex-o-lite.** Shower curtains, bowl covers, umbrellas, etc. St. Lawrence Textile Corp., New York, N. Y.

436,878. **Acitex.** Workers' protective garments. Chicago Eye Shield Co., Chicago, Ill.

436,887. **Mel-Isle.** Mats and runners. L. E. Warford, doing business as Melflex Products Co., assignor to Melflex Products Co., both of Akron, O.

436,888. **Mel-Tred.** Mats and runners. L. E. Warford, doing business as Melflex Products Co., assignor to Melflex Products Co., both of Akron, O.

436,896. **Sine Cera.** Raincoats. W. B. Doran Men's Store, assignor to W. B. Doran Men's Store, Inc., both of Rockford, Ill.

436,899. **Carven.** Raincoats. Société A Responsabilité Limitée, Carven, Paris, France.

436,903. **Super-Tex.** Synthetic resin coatings. Tex Products, Inc., Newark, N. J.

436,927. **Arena.** Footwear. B. F. Goodrich Co., New York, N. Y.

436,948. **Silastic.** Organosilicon polymers. Dow Corning Corp., Midland, Mich.

436,952. **Stockholders.** Garter belts. Fashion Form Mfg. Corp., White Plains, N. Y.

436,959. **"Little Imp."** Infant shoes. Littonian Shoe Co., Germany Township, Littlestown, Pa.

436,974. **Ferodo.** Brake linings and surfacings. Keasbey & Mattison Co., Ambler, Pa.

437,004. **Penros.** Rosin. Newport Industries, Inc., Pensacola, Fla.

437,005. **Hyros.** Rosin. Newport Industries, Inc., Pensacola, Fla.

437,006. **Hyrex.** Rosin. Newport Industries, Inc., Pensacola, Fla.

437,007. **Penbro.** Resin. Newport Industries, Inc., Pensacola, Fla.

437,008. **Fosfo.** Rosin. Newport Industries, Inc., Pensacola, Fla.

437,023. **Concordian.** Men's footwear. G. A. Hill, Jr., doing business as Concordian Shoe Co., West Concord, Mass.

437,024. **Counterpoint.** Corsets, panti-girdles, garter belts, etc. Maiden Form Brassiere Co., Inc., New York, N. Y.

437,032. Representation of a triangle containing the word: **"Actualife."** Footwear. Virginia Shoe Corp., Fredericksburg, Va.

437,048. **Gyro.** Corsets and girdles. Form Flex Foundations, Inc., New York, N. Y.

437,104. **Little Inch.** Tape dispensers. Better Packages, Inc., Shelton, Conn.

437,105. **Velón.** Women's wear. Firestone Tire & Rubber Co., Akron, O.

437,125. **Araldite.** Industrial art resin plastics. Ciba Ltd., Basel, Switzerland.

437,126. **Iteco's Super-Flex.** Dental impression material. Iteco Dental Mfg. Co., Portland, Oreg.

437,202. Representation of a concentric circle and the words: **"Nervastral Seal-Pruf."** Weatherproofing, waterproofing, etc. Rubber & Plastics Compound Co., Inc., New York, N. Y.

437,259. **Mr.** Raincoats. Spatz Bros., Inc., New York, N. Y.

437,294. **Mom-Ease.** Utlity bags. M. Margolin, New York, N. Y.

437,295. **Internal Bath.** Douche syringes, hot water bags and bottles. Tyrell's Hygienic Institute, Inc., New York, N. Y.

437,331. **Raylax.** Heating pads. G. C. Tong, St. Louis, Mo.

437,337. Representation of a circle containing a rod and the letters: **"DH."** Wire. Driver-Harris Co., Harrison, N. J.

437,404. **Cadiz.** Artificial leather. Eggers Fabric Co., New York, N. Y.

437,475. **Tirematic.** Tire removers. Wats Mfg. Enterprises, Miami, Fla.

437,488. **Com-Plastic.** Printers' rollers. W. I. Lewis, doing business as Motor City Roller Co., Detroit, Mich.

437,493. Representation of an emblem containing the letters: **"WSC."** Tire paint. Windsor Lloyd Products, Inc., Philadelphia, Pa.

437,499. **"Chainco."** Balloons. Bayshore Industries, Inc., Elkton, Md.

UNCLASSIFIED

United States

2,436,844. **Resilient Wheel.** H. A. Wells, Sacramento, Calif.

2,436,978-980. **Treating Rayon Tire Cord.** G. P. Standley, Cleveland Heights, and K. M. McClellan, assignors to Industrial Rayon Corp., both in Cleveland, both in O.

2,437,031. **Tire Chain.** P. A. Jasmer, Milwaukee, Wis.

2,437,040. **Non-Skid Device for Tires.** G. T. Prevost and J. M. Downes, both of Bridgeport, Conn.

2,437,057. **Heat-Sealing Method.** H. F. Waters, New York, N. Y.

2,437,632. **Coupling for Tubes.** J. N. Wolfram, assignor to Parker Appliance Co., Cleveland, O.

2,437,811. **Emergency Tire Carrier.** R. E. Folden, Oakland, Calif.

2,437,933. **Hose Connection.** J. B. Brennan, Cleveland, O.

2,438,040. **Hydraulic Vehicle Wheel Drive.** M. D. Duhaime, White Plains, N. .Y

2,438,089. **Packaging an Article between Two Layers of Wrapping Material.** C. M. Carson, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O.

2,438,248. **Tire Chain Assembly.** H. Madison, Fullerton, Calif.

2,438,362. **Arrangements to Hold a Bundle of Wires together.** G. F. Dunkelberger, Yeadon, and A. C. Schehl, Manoa, both in Pa. assignors to General Electric Co., a corporation of New York.

2,438,413. **Low-Pressure Tire Signal.** H. G. Renner, Detroit, Mich.

Dominion of Canada

447,006. **All-Textile Yarn with High-Stretch Characteristics.** B. H. Foster, Maplewood, N. J., U.S.A., assignor to Dominion Rubber Co., Ltd., Montreal, P. Q.

447,009. **In Combination with a Carding Machine, Mechanism for Directing Supersonic Waves through a Web Traveling from a Carding Machine to Detect Variations in the Web Weight.** A. P. Lewis and J. C. Manley, both of Fairhaven, Mass., U.S.A., assignors to Dominion Rubber Co., Ltd., Montreal, P. Q.

447,098. **Anti-Skid Chain.** H. Raz-Ammann, Thun, Switzerland.

447,181. **Hose Coupling.** J. N. Paquin, Detroit, Mich., assignor to Weatherhead Co., Cleveland, O., both in the U. S. A.

447,274. **All-Textile Elastic Fabric.** B. H. Foster, Maplewood, N. J., U. S. A., assignor to Dominion Rubber Co., Ltd., Montreal, P. Q.

United Kingdom

597,291. **Tire Air-Pressure Indicator.** M. Abel and M. M. Gaudoz.

597,691. **Firing Mechanism for Automatic Gun.** Dunlop Rubber Co., Ltd., and H. W. Trevaskis.

597,800. **Apparatus for Determining the Dielectric Properties of Granular or Powdery Materials.** Marconi Instruments, Ltd., and C. F. Brockelsby.

597,941. **Testing Textile Cords and the Like.** Wingfoot Corp.

598,273. **Apparatus for the Volume Measurement of Powders and Porous Bodies.** Dr. Rosin Industrial Research Co., Ltd., and W. Deutsch.

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, or through its field offices, for $1 each. Interested United States Companies should correspond directly with the concerns listed concerning any projected business arrangements.

Export Opportunities

William C. Jackson & Co., 136 Flinders St., Melbourne, Victoria, Australia: elastic yarn.

B. Temperani, 47 Via della Scala, Florence, Italy: batteries, automotive accessories and replacement parts, brake parts, rubber hose.

Société Anonyme Tricotal, 74 Rue des Trois Clefs, Alost, Belgium: elastic.

K. W. Lockhart, representing Ibanez & Gomez, Viamonte 1636, Buenos Aires, Argentina: druggists' sundries.

Alfonso Rubio, representing Almacen Progreso-Hijos de Rafael Rubio T., Carrera 11 No. 11-68-70, Bogota, Colombia: sporting goods.

Chr. Petersen, 26 Hadersleygade, Copenhagen, Denmark: scrap rubber from tires.

Jose Picayo Martinez, Empedrado 409, Habana, Cuba: stationery articles including pencils and erasers.

Rene Feijo de Pontes, representing Rene de Pontes & Cia., Ltda., Rua Floriano Peixoto 61, Recife, Pernambuco, Brazil: automobile spare parts and accessories.

Carlos March, representing Prudencio Llach—"Llach y March," Edificio Duenas, P. O. Box 222, San Salvador, El Salvador: mechanical rubber goods.

Emil Dubs, Sihlstrasse 33, Zurich, Switzerland: ball bearings, Bakelite, hard rubber pipes.

Pahaz, Polska Agencia Handlu Zamorskiego, ul 22 Lipca 55, Sopot, Poland: automobile tires and tubes.

Jose Thome, representing Cia. Industrial do Brasil, Rua da Municipalidade 398, Belem, Para, Brazil: machinery for manufacturing rubber products.

Antero Goncalves, representing Santos e Goncalves, Ltda., Rua dos Douradores 53, Lisbon, Portugal: automobile accessories.

B. Temperani, 47 Via della Scala, Florence, Italy: vulcanized fiber, rubber industrial and agricultural transmission belts.

Import Opportunities

Beurs Van Ninove, Jan Hertveldt, Lavendelstraat 17, Ninove, Belgium: toys, girdles, elastic.

Caeser, 4 Via Bazzi, Turin, Italy: raincoats.

Nuove Industrie Tessili Italiane, 10 Via Arsenale, Turin, Italy: raincoats.

Anglo Baltic Produce Co., Ltd., (Export Dept.), 52-54 Tooley St., London, S.E.1, England: rubber products including gas tubing, shoe sole sheeting, molded half soles, molded heels.

U.M.A.L. Usines and Manufacturers D'Aluminium & D'Alliages Legers, 75 Rue de Trône, Brussels, Belgium: articles for rubber plantations.

Sportapools, Ltd., 30 Floral St., London, W.C.2, England: rainwear.

A. S. Moss and W. Webb, representing Greengate & Irwell Rubber Co., Ltd., Salford 3, Lancashire, England: chemically proofed and rubber proofed garments and cloth.

Trade Lists Available

The Commercial Intelligence Division, United States Department of Commerce, Washington, D. C., recently compiled the following trade lists, of which mimeographed copies may be obtained by American firms interested in the Division and from Department of Commerce field offices at $1 a list for each country.

Chemicals Importers and Dealers—Hong Kong; Hungary; Mozambique; Netherlands India; Spain; Sweden; Poland; Philippine Republic.

Dental Supply Houses—Algeria; Poland.

Electrical Supply and Equipment Importers and Dealers—Hong Kong; India; Ecuador; Martinique; Newfoundland; Bermuda; Sweden.

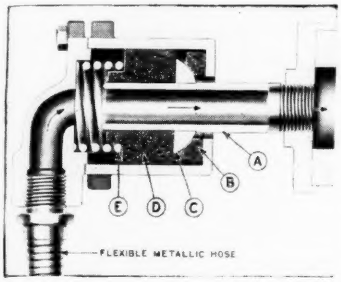
Plastic Materials Manufacturers, Molders, Laminators, and Fabricators of Plastic Products—China; Switzerland; United Kingdom; Ecuador; Sweden; Italy.

Plastic Products Molders—Canada.

Rubber Goods Manufacturers—Belgium; Netherlands; India; Cuba.

Sporting Goods, Toy, and Game Importers and Dealers—India; Costa Rica; Morocco; Netherlands; Netherlands India; Guatemala; Barbados; Hong Kong; Sweden; Mozambique; Algeria; Argentina; Bermuda; China; Greece.

New Machines and Appliances



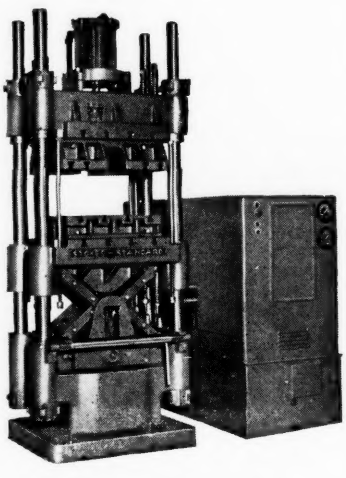
Cross-Section View of Johnson Type-S Rotary Pressure Joint: Nipple (A) Is Attached to Roll; Graphite Seal Ring (B) Fits against Rotating Shoulder (C) on Nipple; Graphite Guide (D) Supports Weight of Joint; and Spring (E) Is for Initial Seating

Pressure Joint

A NEW development of the Johnson rotary pressure joint, the Type-S designed to be self-supporting and require no external piping support, has been announced by the Johnson Corp., 869 Wood St., Three Rivers, Mich. Like the standard Johnson joint, the new Type-S will be used to admit heating or cooling agents to rotating rolls, particularly where considerable lateral movement of rolls is encountered or where supports cannot be satisfactorily provided.

Like all Johnson joints, the Type-S is completely self-lubricating, has no packing of any sort, adjusts itself automatically for varying pressures, and has a spherical sealing surface which maintains an effective seal even though wear should occur at this point. A large bearing or guide of carbon graphite supports the entire weight of the joint. This bearing is accurately fitted inside the body where it provides a bearing surface on the rotating nipple. The seal proper is effected between a hemispherical collar on the nipple and another graphite bearing ring.

The Type-S joint is available in a standard construction having cast-iron head and body with steel nipple and can also be furnished with bronze trim (body and nipple) or in all bronze with stainless steel spring. The joint can also be furnished to provide for syphon drainage pipes. Four sizes are available, ½-, ¾-, 1-inch and 1¼-inches, all suitable for 150-pound pressures and temperatures up to 400° F.



Stokes 150-Ton Plunger Press

New Press

A NEW 150-ton plunger press which utilizes toggle action to lock the mold shut has been announced by F. J. Stokes Machine Co. The plunger cylinder is mounted on the head of the press, and a single motor provides power to two pumping units for actuating the toggle and applying ram pressure. Both toggle and plunger ram move at high speed so that electronically heated preforms may be used to advantage. Pressures may be set independently to suit any particular job.

The method of loading used with this press is optional. A preform or powder charge may be placed in the centering ring of the lower die when open, the die then closed, and the plunger ram actuated. If desired, the charge may be loaded through the top of the closed die between the upper bolsters, and the ram then brought down. Either load-

ing method is automatically controlled by a bar-type controller, which provides the utmost flexibility, permits either manual or semi-automatic operation, is simple to set up or change over, and is separately housed in with the power unit. Once the exact cycle for any particular job has been determined, the controller can be locked to prevent tampering. Other features of the press, which is available also in a 50-ton model, include heavy-duty construction, easy installation, and the ability to be changed over readily to a straight compression molding unit.

Tension Meter

THE Saxl Tension meter for use in the processing of all types of thread-like materials has been developed by the Saxl Instrument Co. Because of its trigger operation and automatic inserter, the meter permits quick and precise checking of all tensions during manufacturing operations. It helps to select the highest safe operating speed for a given filamentous material and thus increases the economy of operation of the machinery employed.

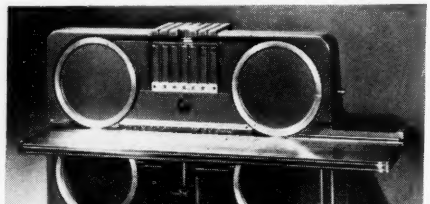
The new meter can be used with all types of filaments, whether copper wire, tire cords, or natural and synthetic yarns. It can also be used to measure the tension in running paper strips, tinsel, and other ribbon-like materials. In addition to use on tire cords in the rubber industry, the meter permits uniform stretch for the rubber used in the manufacture of elastic fabrics, and the accurate tensioning of the textile wrappings for the rubber threads.

New Saxl Tension Meter

Sheet Plastic Beading Machine

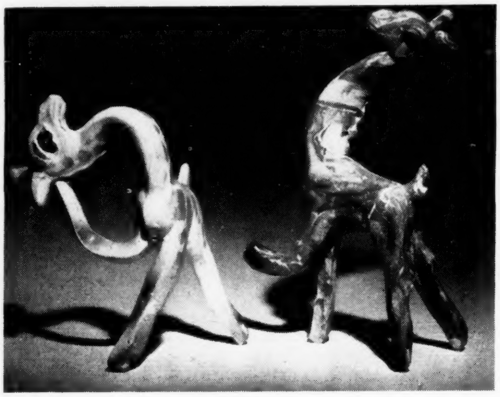
A NEW, improved machine for beading straight edges of thermoplastic sheeting of 0.005-0.020 inch thickness on a high-speed, repetitively uniform production basis has been announced by the Taber Instrument Corp. Designated the Thermobeader, the unit is designed to bead plastic sheet stock, roll material, die-cut blanks, or strips at the rate of 500-1,000 inches a minute, depending on the type and the thickness of the material used.

When used with certain forming and cooling die combinations, as recommended by the manufacturer, the machine forms nine standard beads, each of a different size. These beads (*Continued on page* 276)



Improved Taber Beading Machine

New Goods and Specialties



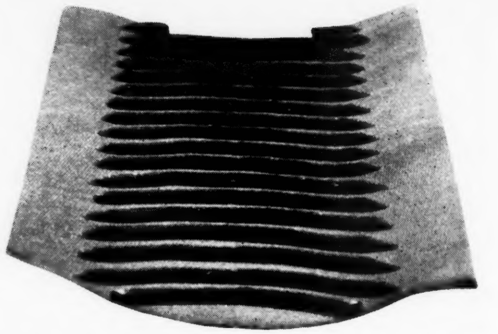
Tillotson's Jiminy Giraflex Wire-Inserted Rubber Giraffe

Toy Giraffe with Flexible Limbs

JIMINY GIRAFFLEX, a new type of rubber toy giraffe, has been announced by Tillotson Rubber Co., Inc. Made of a high-quality rubber stock, the giraffe is molded around a wire insertion in the neck and legs. This wire insertion permits the giraffe's neck and legs to be bent into any desired position and provides a source of added entertainment for children. There are no protruding wire ends, and the toy is therefore safe for use by even the youngest child. A high grade of steel is employed for the wire insertion, and the toy is said to be capable of withstanding a great deal of abuse and twisting. The giraffes are finished in bright colors; both realistic and variegated effects are available. The colors used are harmless, and the toy comes packed in its own individual box. The giraffe is the only wire-inserted toy available at present, but the company plans to add other toy animals to this line.

Ribbed Conveyer Belt

A NEW ribbed-top conveyer belt designed especially to prevent backslip in carrying sand and gravel, wet-mixed concrete, gold dredgings, and other "soupy" materials up steep inclines has been developed by Goodyear Tire & Rubber Co., Akron, O. The new belt features chevron-shaped ribs extending ¼-inch above the belt surface. These ribs serve as barriers, trapping



Section of Goodyear's New Conveyer Belt Showing Chevron-Like Ribs

the water and preventing the backwash of materials down the belt on incline operations.

According to W. P. Hallstein, assistant manager of Goodyears' belting department, the ribbed belt eliminates any noticeable back-slipping of most wet materials on inclines up to a 28-degree angle. The ribbed cleats also substantially increase belt life by reducing the severe wear a back-slipping load inflicts on a conventional belt in motion. The curved ribs are closely spaced to overlap each other and assure a smooth return run of the belt over idlers. The belt has a five-ply rubberized fabric body and a quarter-inch top cover in addition to the ribs. It is being made in widths of 30 to 48 inches and in lengths to suit customers' specifications.

Improved Inner Tube

Pharis' New Butyl Inner Tube

THE new Butyl inner tube announced by Pharis Tire & Rubber Co., is "guaranteed forever against defects in materials or workmanship," according to Hynes Pitner, vice president in charge of sales. The new tubes incorporate several exclusive new features. The vise lock splice is so secure that it is invisible to the naked eye. In addition, a series of radial ribs in four locations on the surface of the tube perform the two-fold function of holding the tube firmly in place and dissipating the heat generated by road friction and the flexing of the tire. Besides its excellent air retention qualities, the new tube, it is said, is also more resistant to heat than crude rubber tubes and, when properly inflated, gives increased riding comfort, safety, and steerability. The new tubes are available in all standard passenger-car and truck sizes.

Beading Machine

(Continued from page 274)

range from 1/16-inch round, 3/32-inch superflex, and 1/8-inch square inside corner types to 3/16-inch square inside corner bead, narrow flat types of 3/32- to 1/4-inch width, and 1/8-inch recessed cardboard snap-in-type beads used for inserting the bottom of circular containers.

Principal design features include interchangeability of dies for forming nine different standard-size beads and shapes; automatic die temperature control; and variable transmission for controlling operating speed in relation to die temperature to compensate for variations in processing. Other basic construction features include sensitive plug-in relays, air-cooled duct-type frame, universal-type preheating die, and quickly changed forming and cooling die holders. Equipped with all essential operating controls, the machine operates on 115- or 230-volt, 50-60 cycle, single-phase current supply.

EUROPE

GERMANY

Review of the German Rubber Industry

The first issues of the first postwar rubber paper published in Berlin has just been received. *Kautschuk und Gummi*, as it is called, will treat rubber from the point of view of the scientific investigator as well as of the manufacturer and the dealer. As explained in the foreword, the title, *Kautschuk und Gummi* (Caoutchouc and Rubber) has been chosen to differentiate between the raw material (*Kautschuk*) and the material (*Gummi*) into which it is converted by chemical and mechanical treatment for use in the actual manufacture of rubber goods.

Several pages of the first issue, January, 1948, are devoted to a review of the German rubber industry as it was before the war, during the war, and as it is in the different occupation zones now. It is recalled that after 1933, rubber manufacturing expanded in certain directions, but was restricted in others, though production as a whole increased; at the same time, partly in line with greater home demand and the government's stockpiling policy after 1937, exports declined. Crude rubber stocks, however, were not so great as might have been supposed, amounting at the outbreak of the war to 14,478 tons. In 1940 stocks were 5,823 tons; in 1941, 14,164 tons; in 1942, 14,576 tons; and in 1943, 15,276 tons. Normal consumption of rubber before the war is put at roughly 80,000 tons, including 7,000 tons of reclaim. The amounts of natural and synthetic rubber available to the industry in the years 1935-44 inclusive are given below (in tons):

Year	Crude Rubber Imports	Production of Buna
1935	65,135	—
1936	73,415	678
1937	99,963	3,233
1938	91,918	5,698
1939	49,270	22,600
1940	—	40,373
1941	31,000	68,024
1942	27,000	96,864
1943	8,000	115,716
1944	5,000	132,000

For 1939, figures of crude rubber imports for the first half of the year only are available. The amounts of rubber brought into the country in 1940 by blockade runners is not known; in 1941 blockade runners brought in 15,000 tons and another 16,000 tons came from Indo-China via the Trans-Siberian Railway. The crude rubber figures for 1942-1944, inclusive, are estimates of quantities of rubber brought in by blockade runners.

During the same period the reclaim industry expanded considerably, finally producing 40,000 tons annually.

In 1933 about 48.1% of the rubber went into the manufacture of tires; by 1936 the proportion was about 55% of total rubber consumption, including latex and synthetic rubber.

Current Situation in the Occupation Zones

Turning to the present, it is pointed out that the new industry plan for Bizonia set up in August, 1947, provides for production approximately at the level of 1936, considered the last normal year of peacetime industry. In that year the German rubber industry (exclusive of the cable and wire branches, toys, and a few other minor lines) used about 65,000 tons of rubber, of which about 40,000 tons went into tires, 4,900 tons into belting and hose, 5,700 tons into other soft rubber goods, 2,800 tons into heels and soles, 1,800 into footwear, 2,950 tons into rubberized fabrics, 1,100 tons into thread, 2,100 tons into hard rubber goods, and about 3,200 tons into other rubber goods.

It is considered that the 1936 level of outputs could be reached in Bizonia provided general economic developments are favorable. But in the Eastern, or Russian zone, this is hardly looked for within a reasonable period because of the extensive dismantling of factories which has taken place here and which is expected to have a far-reaching effect on the general picture of rubber production in the country.

The German rubber industry was formerly concentrated in four large centers—North Germany, including Hannover and Hamburg; Rhineland-Westphalia, including Dusseldorf, Cologne, and the Ruhr territory; Southern Germany, with Mannheim, Frankfurt a. Main, and Munich; Central Germany (Saxony and Thuringia) and Greater Berlin. The most important center of the industry—lower Saxony, North-Rhine, and Westphalia, including the rubber city, Hannover—are in the British zone of occupation. In 1936 the rubber factories here produced 51.3% of the total output of rubber manufactures and accounted for 57.1% of the total exports. Next in importance is the United States zone,

followed by the Eastern zone, Greater Berlin, and finally the French zone

The important Buna factories are in the Russian zone (Schkopau), in the British zone (Huls and Leverkusen), and in the French zone (Ludwigshafen). There are no Buna factories in the American zone. In 1941 the factories in the British zone produced 27,300 tons of Buna; Schkopau produced about 40,000 tons, (Schkopau is said to have produced 60,000 to 70,000 tons of Buna in 1944), the French zone only 1,000 tons. In the first quarter of 1947 the British zone produced 2,000 tons of Buna, but stopped production later in the year; the Russian zone produced 8,500 tons, and the French zone nothing. (From another source it is learned that in March of this year all Buna production in Germany was stopped as it required too much coal and costs were too high.) In Bizonia, natural rubber largely replaced Buna in 1947; imports of natural rubber were about 13,000 tons; for the current year, about 40,000 tons of natural rubber are expected in Bizonia.

Rubber Manufacture in Bizonia

After various ups and downs, production of rubber goods in Bizonia has been on the increase again, and in July, 1947, the production index (1936, 100%) was 46%, against 38 in the same month of 1946. Production of tires for motor vehicles in this territory in 1936 reached 2,724,000 units out of a total for the country of 3,852,000 units. In 1946, outputs rose regularly, from 168,100 units in the first quarter, to 203,000 in the second, 224,900 in the third, and 245,300 in the last quarter of the year, making in all 841,300 units. In the first quarter of 1947, output dropped to 130,000 units, but rose in the second quarter to 264,000 units, to bring the total for the first half of 1947 to 394,000 units. It was expected that a further increase of at least 25% would be shown by the end of the year. The chief difficulties in the industry are caused by shortages in certain chemicals, coal, and tire fabric.

In the first half of 1947 outputs also included 386,000 automobile tubes, 1,848,000 cycle tires, and 1,803,000 cycle tubes.

Soviet Zone

The postwar development of the rubber industry in the Eastern or Soviet zone differs radically from that in the Western zones. Apart from the fact that factories have been dismantled, the entire structure of the industry has been changed; it now includes three elements—Soviet-owned, national, factories, privately owned factories. Of the rubber and asbestos works in the zone, 68.6% (according to another source, 64%) are owned by the Russian Government. In the province of Saxe-Anhalt, there are 11 registered Soviet concerns, the largest of which is the S. A. G. der Gummi Industrie Kautschuk, with a capital of 600,000,000 rubels, embodying, it is said, the best-known companies of the region, among them the Buna factory at Schkopoau. As founders of this organization are mentioned the General Administration of Soviet Foreign Property at the Foreign Trade Ministry of the U.S.S.R., and various Russian import and export associations. The factories in Thuringia are combined in the S. A. G. Resino Technika in Erfurt and include the firms, Vollrath & Sohn, in Blankenburg, Thuringer Schlauchweberei und Gummiwerk, in Waltershausen, and Blodner & Vierschrodt and the Gothania Works, both in Gotha. These Soviet companies are under the Chief of Administration of Soviet Joint Stock Companies in Germany.

The 12 national rubber and asbestos factories in Saxony, chiefly in Leipzig and Dresden, come under the Chemical Division of the Industrial Administration in Dresden. The national concerns have no financial independence; they are allotted raw materials by the Industrial Offices, and sales are made through and controlled by the Trade Offices.

Interzonal trade is still on a very limited scale. According to American sources, rubber and asbestos goods to a value of 5,421,000 marks were sent from Bizonia to the Eastern zone in 1946; while the latter supplied rubber and goods to a value of 5,084,000 marks. An arrangement in Berlin provides for delivery by Bizonia of rubber goods to a value of 2,800,000 marks in 1948, against 4,300,000 marks by the Eastern zone. These quotas, it is pointed out, are in accordance with the former relative production capacities of the respected zones.

New Rubber Committee

A Rubber Committee was recently formed by the Chemical Division of the Chamber of Technology in the Soviet zone. It held the first session in Berlin on January 6, 1948, when several organizations, including the Materials Testing Bureau of Berlin-Dahlem and the Technical University of Berlin, as well as some large rubber firms of the Eastern zone, were represented. The chief topic treated was the situation created by the shortage of machinery, raw materials, and compounding ingredients. Most of the factories making rubber machinery are in the Western zone, but these have been able to supply only limited quantities so that

the advisability was considered of developing the manufacture in the Eastern zone chiefly of calenders and milling machines for use in making cycle tires, sanitary goods, footwear, and the like. Practically all raw materials, except Buna, were stated to be in short supply, and the situation seems to be particularly acute with regard to accelerators, for the production of which there is no factory in the Eastern zone. The question of starting the production of accelerators here was also discussed.

FRANCE

Experiments with Ammoniated Latex

That ammoniated latex that has been stored for some time and has thus undergone a natural degradation can be rendered heat-sensitive by merely adding zinc oxide was shown by Lepetit, of the Institut Français du Caoutchouc.[1] Later experiments carried out by him and Hooreman[2] aimed at artificially reproducing natural degradation with recently ammoniated latex. At first it was attempted to attain the requisite degree of degradation by heating the latex, and it was found that this could be accomplished by heating in a sealed tube for two to three hours in an autoclave under four kilograms' pressure, at 143° C. However this method has several disadvantages—heating in the autoclave is not a practical operation; the material obtained shows a brown-tinted surface after drying; and the tensile strength is rather markedly inferior to that of an untreated mix. Biochemical degradation of latex was then decided upon, and trypsin proved suitable for the purpose. Experiments showed, however, that the trypsin in the pancreas of pigs is much more effective than that in the pancreas of sheep. The former was found useful in ordinary or concentrated latex and also supported further degradation of old, ammoniated latex.

Ammoniated latex degraded by trypsin is suitable for cold molding. The method used follows. Latex having a dry rubber content of 58-60% and including 0.6% of ammonia is treated with 0.2% of powdered pig pancreas in the form of a 10% aqueous suspension. After four to five days of digestion, the latex has reached the appropriate stage of degradation, being still stable enough to be normally kept even in the presence of vulcanizing ingredients—except zinc oxide. The latter is added at the time when the latex is to be used; then the mixture is run into cold molds. Coagulation takes place in two to three hours, or even less, depending on the ambient atmosphere.

The process offers the advantage of doing away with heating devices; the coagulum is self-adhering, useful when an article must be made of separately molded parts, and finally it permits the use of molds of cheap materials.

[1] *Rev. gén. caoutchouc.*, 24, 1, 390 (1947).
[2] *Ibid.*, 25, 1, 3 (1948).

Frantex A—New Active Filler

The Soc. Franterre of Paris has developed a new active filler known as Frantex A. The principal constituent of this product is halloysite, a hydrated silicate of alumina, belonging to the large family of clays. Frantex A is marketed in the form of a fine, pale-gray powder having a density of about 2.35, and it is readily suspended in water forming very stable suspensions which can be kept for a long time without much sedimentation. These suspensions are perfectly compatible with natural rubber latex as well as with most synthetic latices, being readily incorporated without complicated devices or expensive treatments.

The new filler can be used with a combination of accelerator of the Mercapto type with DPG; with accelerators like Santocure, Vulcacit AZ, Rhodefax 12 or 14, Acrin, or the like; also with the Urekas; with the thiurams and dithiocarbamates, especially TB and TE; and with a combination of mercapto-type accelerator and Thiurams. Neither DPG nor the aldehyde amines should be used alone with Frantex A. The proportion of sulfur should be kept low, that is, not above 2.5 parts for 100 parts of natural rubber. With regard to plasticizers, it is pointed out that the addition of stearic acid is not essential, and that comparatively large proportions of Naftolen, red oil and pine tar may be used.

French Rubber Trade Notes

On January 19, the Académie des Sciences elected Charles Dufraisse to its Chemical Section, in succession of Robert Les-

pieau. Professor Dufraisse, honorary president of the Institut Français du Caoutchouc, is known to the rubber industry especially for his work on antioxidants.

J. LeBras, director of the Research Center of the I.F.C. left in January to visit plantations in Indo-China and Malaya.

At the I.F.C., on January 14, G. Van der Bie, of Buitenzorg, Java, spoke on the work of the rubber research organizations in Netherlands India, particularly of rubber-bitumen mixtures, concentration of latex by centrifugation, investigation of the white and yellow fraction of latex, and the effect of copper on fresh latex.

GREAT BRITAIN

The Institution of the Rubber Industry held its twenty-sixth annual meeting in London on February 27, when F. D. Ascoli was elected president for the ensuing year.

At the recent ordinary meeting of the Rubber Growers' Association in London, Charles Mann, director of Guthrie & Co., Ltd., was elected chairman, and A. H. Doherty vice chairman, for the ensuing year.

At Fort Dunlop experiments are said to be in progress with a new tire, the use of which will improve radio reception on automobiles. This tire, based on one used by the RAF during the war, removes static electricity generated by the movement of the tread on the road surface.

At the eighth annual general meeting of the Waste Rubber Merchants Association of Great Britain, held in London, February 25, Chairman B. Chase, pointed out, in the course of his report, that all grades of waste rubber except red automobile tubes are now free for export. Under appropriate conditions, applications for export of red automobile tubes might be favorably considered by the Rubber Directorate.

On February 28, 1948, it was exactly 60 years since the first pneumatic tire made by John Boyd Dunlop was used. The diamond jubilee was celebrated at the premises in May St., Belfast, Ireland, where the tires were invented, and at Fort Dunlop.

The Third Foundation Lecture under the title of "Rubber Research, Rubber Investigations and Rubber Empiricism," is to be delivered in Manchester by W. J. S. Naunton, on June 18.

R. G. James, technical manager of the Lastex Yarn & Lactron Thread Co., Leicester, has been appointed factory manager of this company operating at Fort Dunlop. Dr. James succeeds John Healey, who recently retired after 40 years' service.

The number of workers employed in the rubber industry in the United Kingdom reached the record total of 86,500 (55,900 men and 30,600 women) in December, 1947.

Rubber Improvement, Ltd., has acquired an additional factory in Wellingborough, Northants, where it is proposed not only to expand the production of rubber and plastic products and semi-processed raw materials, but also to set up a unit for the production of conveyer belts.

ITALY

The Italian rubber industry is reportedly making good progress despite financial difficulties, chiefly affecting the numerous smaller firms. Production, which in 1946 was 48% of the 1938 level, on a weight basis, is estimated to have almost reached the prewar level. As before, tires and cables are the main products, but many firms, especially those established recently, are specializing in mechanical rubber goods, sporting and sanitary goods, and articles for household use.

It is understood that the industry now includes 137 undertakings which used about 40,000 tons of rubber in 1947 and employed 42,000 persons.

The plastics industry in Italy has branched out and has developed considerably of late. According to a statement in a foreign publication, the industry is now second only to that of the United States. The huge Montecatini concern largely controls the plastics industry; however, several large iron and steel firms have also recently begun to take an active interest in the manufacture of plastics.

Before the war phenol-based plastics were the main products; now a variety of other materials is made, including Galalite, Bakelite, Plexiglas, Plexigum, Cellon, and Lasto. But the most important plastic seems to be Vipla, a calcium-carbide based product used chiefly for insulations, soles, and tubing.

It is understood to be the aim of the Italian plastics industry to take the place of Germany in the market for plastics, and in 1947 almost a third of the Italian output of roughly 18,000 tons was exported.

SWITZERLAND

The Swiss railways are experimenting with pneumatic tires on their light express trains. Swiss plants, working in collaboration with the Michelin rubber concern of France, are building two trial passenger coaches, each to be equipped with 20 wheels. To test the proper degree of lightness required by the rubber tires, one coach will be constructed of an aluminum alloy and the other of ordinary soft steel. If the experiment proves successful, it is expected to equip all light Swiss trains with pneumatic rubber tires within the next ten years.

FAR EAST

Thoughtful people out here, considering the extent to which Malaya economy has been depending on two products, tin and rubber, have from time to time sounded warnings against the practice of putting all eggs in one basket. Now again, with American synthetic rubber to reckon with, to say nothing of the huge potential output of Netherland India, the country is being urged to adventure into other fields. With so many tropical products in short supply, it is pointed out, this time would seem to be most opportune for planters to turn their attention to new crops. Actually a start has already been made with the production of hemp, and interest is also being stimulated in growing cocoa. So far, however, the greatest promise for development in the desired direction away from rubber seems to be held out by the already established young oil-palm industry, which recently received an enormous fillip by the decision of the great Unilever concern to establish a margarine and soap factory in Malaya.

Heavy monsoon rains in December and part of January have brought flood conditions to various parts of Malaya, and many homes have been washed away, rice fields destroyed, and, here and there too, rubber estates, roads and railway culverts have been damaged. Even on estates where no appreciable direct damage was sustained, the heavy rains interfered with tapping, and it is expected that this interference will be reflected in reduced outputs. The destruction of rice fields has fortunately not been on a sufficiently large scale to affect seriously the country's rice crop, which in spite of bad weather is expected to be better than average. This matter is of no little importance since much of the recent unrest among labor has been ascribed to shortage of rice.

Ceylon's business in crude rubber declined last year. The amounts exported totaled only 80,860 tons, against 101,772 tons in 1946 and the record 111,929 tons in 1942. The average price per pound obtained in 1947 was 75 rupee cents, as compared with 99 rupee cents in 1946. Of the 1947 exports, 47,924 tons went to the United States; the United Kingdom took 18,846 tons; France, 2,924 tons; Canada, 2,147 tons; Belgium, 1,429 tons; Australia, 1,085 tons; and Italy, 1,057 tons.

Editor's Book Table

BOOK REVIEWS

"Volumetric Analysis. Volume II, Titration Methods." Second Revised Edition. I. M. Kolthoff and V. A. Stenger. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Cloth, 6 by 9 inches, 384 pages. Price $6.

This new edition of what has become a standard textbook on titration methods in volumetric analysis is a modern and comprehensive presentation of critically selected methods for the volumetric analysis of organic and inorganic materials, for use in conjunction with Volume I which covers theoretical principles. Because of the detailed treatment of this new volume, oxidation-reduction methods will be covered in a forthcoming Volume III. The present book, with considerable revision and addition, includes all other material given in Volume II of the previous editions.

Volumetric glassware, calibrations, and standard reagents and materials are covered in the first three chapters. The third and fourth chapters deal with acid-base reactions, which are further expanded in three chapters on displacement, hydrolytic precipitation, and complex formation. Individual chapters are devoted to argentometric titrations, other precipitation methods, and formation of slightly dissociated or complex compounds. Completing the book are a table of atomic weights, a list of standard materials, and both author and subject indices.

"Fatty Acids, Their Chemistry and Physical Properties." Klare S. Markley. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Cloth, 6 by 9 inches, 678 pages. Price, $10.

This important contribution to the literature gives an organized, readily accessible, and comprehensive presentation of data pertaining to the chemical reactions and physical properties of fatty acids, particularly those contained in natural fats, oils, and waxes. This book presents in systematic form information which has been widely scattered and relatively unorganized in the accumulated literature on this subject. The value of the book is further enhanced by the many tables and graphs of properties, the numerous references cited, and the inclusion of both laboratory and commercial methods for the separation and preparation of fatty acids and their derivatives. Separate sections cover nature and history of fatty acids, classification and structure, physical properties, chemical reactions, synthesis, and isolation and identification. Each section is further subdivided for ready reference and organization. Comprehensive indices, both of authors and subjects, are also included.

"Small Wonder—The Story of Colloids." Gessner G. Hawley. Alfred A. Knopf, Inc., 501 Madison Ave., New York 22, N. Y. Cloth, 5½ by 8½ inches, 246 pages. Price, $3.50.

This attempt to explain the science of colloids to the average layman must be considered eminently successful. In a simple, clear, and entertaining style the author gives a general discussion of the fundamental principles, the problems, and the achievements and advances of colloid science. Many photographs and drawings are used to illustrate the text, which is presented in readily understandable, non-technical language. The role of colloids in rubber latex is discussed among other applications. The chapter on latex gives an interesting, although simplified explanation of latex composition, handling, concentration, compounding, and fabrication, with emphasis on the colloidal viewpoint during the different latex treatments.

"Phenoplasts—Their Structure, Properties, and Chemical Technology. High Polymers, Volume VII." T. S. Carswell. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Cloth, 9 by 6 inches, 278 pages. Price $5.50.

This volume is a commendable attempt to review the physical and chemical properties and structure of phenolic plastics and to correlate their structure with their properties in the light of present knowledge. The author summarizes the various theories that have been presented on the phenol-aldehyde reaction and tries to correlate some of these theories of the reaction mechanism. Several lines of attack are suggested on the problem of correlating structure with chemical composition, and the author emphasizes the need of continued research on this matter.

The subject matter covers the history of the development of phenoplasts, their formation from higher aldehydes and poly-

hydric phenols, and their physical structure. Detailed descriptions are given of fillers used in phenolic molding powders, together with their functions, and a corresponding chapter covers fillers and resins for phenolic laminates. The mechanical, electrical, thermal, and chemical properties of the phenolic plastics are comprehensively discussed in consecutive chapters. Following a chapter on the oil-soluble phenoplasts, comes one on phenolics as ion-exchange resins, written by Donald S. Herr. The technical manufacture of phenoplasts is described in a general manner, and Carl H. Whitlock has written a chapter on molding technique for phenoplasts. The concluding chapter gives numerous applications of the phenoplasts, including many war applications, and illustrates their versatility. Adequate author and subject indices are appended.

NEW PUBLICATIONS

"Rubber Chemicals and Their Uses." Akron Chemical Co., 255 Fountain St., Akron 4, O. 43 pages. This loose-leaf booklet lists and gives information on the company's products, including accelerators, wetting agents and other latex chemicals, colors, carbon blacks, clays, resins, plasticizers, and other rubber chemicals. A classified index of products is also included.

"Farrel Centennial, 1848-1948." Farrel-Birmingham Co., Inc., Ansonia, Conn. 32 pages. This handsome illustrated booklet commemorates the one-hundredth anniversary of the founding of the company's Ansonia plant. Besides a history of the company with drawings of the initial plants at Ansonia and Birmingham, there are given the presidents of the company and its predecessor companies, highlights of the first 100 years, the company's role in four major wars, its World War II production record, its present status and officers, and its products.

"Precipitated Calcium Carbonates, Their Manufacture, Properties, and Applications." Robert H. Buckie. West Virginia Pulp & Paper Co., 230 Park Ave., New York 17, N. Y. 46 pages. After an introduction, this booklet gives detailed information on the manufacturing processes, properties, and applications of the company's calcium carbonates, Snow Top and Caltec. Appendices on particle sizes and the Microsizer are included, together with lists of references and other company products, and an index.

"Zenite as a Non-Staining, Non-Discoloring Antioxidant." BL-222, March 1, 1948. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 4 pages. This bulletin presents information and test data revealing that the use of Zenite in natural rubber in excess of the amount necessary for acceleration, activated by a small amount of Thionex, gives compounds having good aging properties together with no staining or discoloration.

"GR-S Latex Type III and GR-S Latex Type IV, General-Purpose Synthetic Latices." March, 1948. Office of Rubber Reserve, RFC, Washington 25, D. C. 8 pages. This bulletin gives information on development, special and general properties, applications, storage, compounding, and availability of Types III and IV GR-S latex.

"The Selection and Use of Fatty Acids." Armour & Co., 1355 W. 31st St., Chicago 9, Ill. 20 pages. This booklet outlines the major fields of application of the different fatty acids and their derivatives, including rubber compounding, and for each application explains the properties needed, functions performed, and type of fatty acids commonly used. A table of the company's Neo-Fat fatty acids is included and gives chemical properties and typical uses.

"Study of Acceleration and Retardation with Philblack O in Natural Rubber Treads." Philblack Bulletin No. 10, March, 1948. Phillips Petroleum Co., Akron, O. 3 pages. The use of Philblack O in natural rubber treads requires some deviation from standard practices with conventional blacks in the use of accelerators and retarders. Several types and combinations of accelerators and various retarders were investigated, and some 15 recipes with their respective data are presented herein.

"Statex B." Bulletin No. 142 Binney & Smith Co., 41 E. 42nd St., New York 17, N. Y. 8 pages. This bulletin covers the use of Statex B, an FF black, as a whole or partial replacement for channel black in heavy-duty tread stocks, blends for passenger treads and similar compounds, and in general applications. Comparative costs are given together with extensive laboratory test data on properties of the different stocks.

"Be Safe!" The B. F. Goodrich Co., Akron, O. 36 pages. Safety education is the subject of this vest-pocket booklet distributed to all employes of the company's industrial products division. Specific safety measures are described, and the text is emphasized by the use of many cartoons and jingles to point the moral of each lesson.

"Engineering Laminates." Walter C. Voss. Edgar Marburg Lecture, 1947. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Paper, 36 pages. Price $1.
"Falk Backstop." Bulletin 10,080. The Falk Corp. 4 pages.
"Horses to Horsepower." Franklin M. Reck. Automobile Mfrs. Assn., New Center Bldg., Detroit 2, Mich. 48 pages.
"Beth-Tec." Bethlehem Foundry & Machine Co., Bethlehem, Pa. 4 pages. **"Publications of the National Research Council of Canada."** Second Edition, 1918-1946 (N.R.C. Nos. 1-1412). Publication N.R.C. No. 1638, August, 1947. National Research Council of Canada, Ottawa, Ont., Canada. Paper, 132 pages.
"Large Elastic Deformations of Isotropic Materials. Part I. Fundamental Concepts. Part II. Some Uniqueness Theorems for Pure, Homogeneous Deformation." R. S. Rivlin. Publication No. 92. The British Rubber Producers' Research Association, 48 Tewin Rd., Welwyn Garden City, Hertfordshire, England. 50 pages. Publications of Bauer & Black, Division of Kendall Co., 2500 S. Dearborn St., Chicago 16, Ill. **"Bauer & Black Non-Staining Industrial Adhesive Tape No. 158."** 4 pages. **"No. 263 Pressure Sensitive Adhesive Tape."** 4 pages. Communications of Rubber-Stichting, Delft, Holland. Nos. 64-66. G. J. van der Bie. **"Determination and Occurrence of Iron in Crude Rubber."** 7 pages. **"Determination of the Rubber Content of *Hevea* Leaves."** 5 pages. **"Influence of the Presence of Traces of Strong Acids on the Durability of Crude Rubber."** 7 pages. **"Developing Public and Industrial Relations Policy."** General Management Series No. 140. American Management Assn., 330 W. 42nd St., New York 18, N. Y. 52 pages. Price $1.00.

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Pyroxylin-Coated Fabrics and Paper

THE following are the figures for pyroxylin-coated fabrics and paper for the fourth quarter and the full year of 1947, as reported by the Bureau of the Census, United States Department of Commerce. The statistics are based on reports from 27 companies and represent the operations of processors who coat or impregnate fabrics or paper with soluble cotton or pyroxylin preparations, either separately or in combination with other materials. "Light" cotton fabrics include sheetings and print cloths; "heavy" cotton fabrics include drills, ducks, sateens, broken twills, and moleskins. All figures are given in linear yards, except for pyroxylin spread and monthly capacity, both of which are given in pounds.

	October	November	December	1947 Tota
Total (except non-fabric materials):*				
Shipments	5,564,693	5,137,947	5,497,056	78,425,660
Unfilled orders†	7,025,568	7,122,121	6,816,494	6,816,494
Light cotton fabrics:				
Shipments	2,179,952	2,348,511	2,345,689	40,609,213
Unfilled orders†	3,614,906	2,932,873	3,318,140	3,318,140
Heavy cotton fabrics:				
Shipments	2,057,725	1,582,725	1,872,286	24,213,396
Unfilled orders†	2,900,960	2,987,530	2,600,582	2,600,582
Custom coating:‡				
Shipments	1,327,016	1,206,711	1,279,072	13,603,051
Unfilled orders†	509,702	1,201,718	897,772	897,772
Non-fabric materials:				
Shipments	217,300	152,092	156,736	2,288,953
Unfilled orders	208,960	256,269	204,693	204,693
yroxylin actual spread, *lbs*	4,698,631	4,543,471	5,373,060	66,157,635
onthly capacity§ *lbs*	16,970,347	16,970,347	16,970,347	....

Data include an undetermined quantity of custom coating of non-fabric materials.
Orders on hand at the close of the month, exclusive of contracts, with shipping dates unspecified.
Data for fabrics other than cotton are included with custom coating to avoid disclosing data for individual establishments.
Based on all machines suitable for pyroxylin coating, assuming 600 working hours per month of entire production on 53"—1.32 sateen coated to a finished weight of 17.5 oz./linear yd., assuming 40% solids.

Market Reviews

CRUDE RUBBER

Commodity Exchange

WEEK-END CLOSING PRICES

	Feb. 28	Mar. 27	Apr. 3	Apr. 10	Apr. 17	Apr. 24
Apr.	19.00	20.52	22.10	22.65	22.65	23.15
May	18.70	20.52	21.75	22.20	22.20	22.95
June	18.15	20.30	21.25	21.20	21.10	21.70
July	18.05	20.20	21.15	21.10	21.00	21.61
Aug.	17.75	20.00	20.85	20.75	20.65	21.20
Sept.	17.65	19.90	20.77	20.65	20.55	21.10
Oct.	17.35	19.80	20.72	20.60	20.45	21.05
Nov.	17.25	19.80	20.67	20.50	20.40	21.00
Dec.	17.15	19.80	20.62	20.40	20.35	20.95
1949						
Jan.-May ..	17.15	19.80	20.60	20.40	20.35	20.95
June	....	....	20.60	20.40	20.35	20.95

AFTER a slow start, rubber futures prices moved upward during April on the Commodity Exchange, leveling off only as the end of the month approached. Market sentiment continued to find support for a strong crude rubber price level in the expectation of a rise in rubber consumption during the next few months. Other factors bolstering the market were the relative scarcity of high-quality grades, especially for nearby deliveries, the advances in the primary markets, and expectations of increased demand under ERP. May futures opened the month at 21.40¢ rose to a peak of 23.00¢ on April 29, then leveled off and closed at 22.85¢ on April 30. Other futures prices showed the same trend, although the greatest advances were made in the near and middle months. Trading was generally irregular throughout April, and there were a good deal of speculation, switching between nearby and distant months, and exchanges. Total volume of sales on the Exchange during April was 25,100 tons, compared with 26,230 tons during March.

Besides the current scarcity of No. 1 ribbed smoked sheets deliverable at basis price against exchange contracts, the market is generally short of bona fide Nos. 2 and 3 sheets which can be tendered at discounts of 50 and 100 points, respectively. It was also reported to be difficult to obtain supplies of Nos. 2 and 3 sheet which are guaranteed as to quality. Much of the rubber now selling in these classifications is said to be actually of lower quality, based on exchange standards. This quality factor is one of the reasons for the large differential in price between these grades and the No. 1 grade. Another reason for this differential is the reluctance of consumers to use the poor-quality natural grades when they can obtain uniform, high-quality synthetic rubber for approximately the same price.

Little significance was given to the current rotation of national stockpiles launched by the government during the month. Some sources believe that the rotation program may increase the overall demand for upper grades, because the government is believed eager to round out inventories with top grades both in the rotation program and in its direct buying operations.

Trade interests indicated the strong possibility of a squeeze in the May contract. Supplies of deliverable grades remain small when compared with open interest, and the short interest in May is believed to be predominantly in the hands of dealers who are eager to secure delivery.

Bolstering the market in addition to the advances in the London and the Singapore rubber centers were the announcements by Goodyear Tire & Rubber Co., Seiberling Rubber Co., and Firestone Tire & Rubber Co., that they were resuming the six-day work week. These announcements were taken as tangible evidence of higher tire demand and consequent greater rubber consumption despite statements from United States Rubber Co. and The B. F. Goodrich Co. expressing belief in a reduced rubber consumption this year.

The Commodity Exchange cut rubber futures trading margins by $100 to $150 effective April 19. Margin requirements on general transactions were lowered from $900 to $750 per contract, long or short. Hedging margins were reduced from $600 to $500. Original margins on straddle transactions were held unchanged at $200.

New York Outside Market

WEEK-END CLOSING PRICES

	Feb. 28	Mar. 27	Apr. 3	Apr. 10	Apr. 17	Apr. 24
No. 1 Ribbed Smoked Sheets:						
Apr.	19.13	20.75	22.50	23.00	23.00	23.38
May	19.13	20.63	22.00	23.00	23.00	23.25
June	19.13	20.50	21.75	22.00	21.75	....
July-Sept.	18.25	20.38	21.50	21.38	21.25	21.75
No. 3 Ribbed Smoked Sheets ..	19.00	18.88	19.75	20.25	19.75	20.50
No. 2 Amber	15.88	16.50	17.63	17.38	17.00	17.25
Flat Bark ..	12.50	13.13	13.25	12.75	12.50	12.75

PRICE movements on the New York Outside Market during April paralleled those on the Commodity Exchange and were affected by the same factors. Factory buying was moderate and concentrated on the quality grades for nearby delivery, although some scattered interest in middle deliveries and in the Nos. 2 and 3 sheets was noted. The scarcity in No. 1 sheet for nearby delivery apparent in the Commodity Exchange was even more noticeable in the Outside Market and played a major role in forcing the price advance. As for stockpile purchasing, it was indicated that government buying had taken only small amounts during the month, although more active interest by government buying agents was noted toward the end of April.

The spot price for No. 1 Ribbed Smoked Sheet was 22.13¢ on April 1, rose to the high of 23.38¢ on April 23, and again on April 28 and 29, the last day of trading for spot delivery. May to September deliveries for No. 1 sheet showed corresponding fluctuations, but the lack of interest in the low-quality grades was exemplified by the price for No. 3 sheet, which opened the month at 20.13¢, fluctuated between 19.38¢ and 20.25¢ for most of the month, reached the high of 20.50¢ on April 23, dropped slightly, then stayed at 20.50¢ from April 28 to 30.

Latices

LATEX prices have held firm despite the steady advance in dry rubber prices which has narrowed the differential or premium for latex. According to Arthur Nolan, Latex Distributors, Inc., writing in Lockwood's April *Rubber Report*, the high prices for quality dry rubbers are expected to continue during stockpiling and ERP operations and would indicate that latex prices will also continue at present or higher levels.

There is probably upward of 1,000 tons a month of latex used in tire fabrics, Mr. Nolan says. During the past few years practically all of the latex used for this purpose has been GR-S latex. With the greater availability of *Hevea* latex, tire manufacturers are again picking it up, although this changeover is handicapped by its high open market price as compared to GR-S latex.

Mr. Nolan gave February imports of *Hevea* latex as 2,400 long tons, dry weight; consumption, 1,844 long tons, dry weight; and month-end stocks, 7,241 long tons, dry weight. March production of GR-S latex is estimated at 1,800 long tons, dry weight; while that of neoprene latex is given as 577 long tons, dry weight. Prices for *Hevea*, GR-S, and neoprene latex remain at the levels given in our January and February issues.

Fixed Government Prices*

Guayule

Guayule *(carload lots)*	$0.17½

Latex†

Hevea, normal *(tank car lots)*	.30¾
Centrifuged *(tank car lots)*	.32½
GR-S, Type 2 *(tank car lots)*	.18½‡
(Carload, drums)	.268
(Less carload, drums)	.273
Types 3 and 4 *(tank car lots)*	.18½‡
(Carload, drums)	.26
(Less carload, drums)	.26½
Type 5 *(tank car lots)*	.20¼‡
(Carload, drums)	.27¾
(Less carload, drums)	.27¾

Plantation Grades

No. 1X Ribbed Smoked Sheets	.23
1X Thick Pale Latex Crepe	.29
1 Thick Pale Latex Crepe	.29
2 Thick Pale Latex Crepe	.28½
3 Thick Pale Latex Crepe	28¾
1X Thin Pale Latex Crepe	.29
1 Thin Pale Latex Crepe	.29
2 Thin Pale Latex Crepe	.28½
3 Thin Pale Latex Crepe	.28¼
Liberian A	.28⅝
AA	.29
RCMA Watermarked Crepe No. 16	.37⅞
17	.32⅜
18	.30⅞
Sole Crepe Trimmings	.28½
No. 1X Thin Pale Latex Crepe Trimmings	.28½
1X Brown Crepe	.21⅞
2X Brown Crepe	.21⅝
2 Remilled Blankets (Amber)	.21¾
3 Remilled Blankets (Amber)	.21⅝
Rolled Brown	.185

Synthetic Rubber

GR-M (Neoprene GN)	.32
GR-M-10 (Neoprene GN-A)	.32
GR-S (Buna S)	.18½
GR-I (Butyl)	.18½

Wild Rubber

Upriver Coarse (crude)	.12⅝
(Washed and dried)	.20¼
Islands Fine (crude)	.14⅝
(Washed and dried)	.22½
Caucho Ball (crude)	.11⅝
(Washed and dried)	.19½
Mangabiera (crude)	.08½
(Washed and dried)	.18

* For a complete list of all grades of dry rubbers see Rubber Reserve Co. General Sales and Distribution Circular, July 1, 1945, as amended.
† Prices per pound total solids.
§ Plus average freight charge of 0.75¢ per pound dry weight.

SCRAP RUBBER

THE scrap rubber market during April showed little change from conditions prevailing in March. Market undertones

were manifestly easier, especially during the beginning of the month, and shipments were somewhat irregular. Despite a general slowdown in demand, mixed auto tubes rose from 4.00¢ per pound to 4.25¢, and red passenger tubes advanced from 7.00¢ per pound to 7.25¢, both in the East and at Akron. Other scrap rubber prices held steady even though reclaimers were said to be showing extreme caution in making purchases.

The export business remains good although some exporters say that pressure has eased somewhat because of the inability of foreign buyers to obtain import licenses. There is some demand abroad for beaded and beadless auto tires for the manufacture of sandals, heels, and soles, also for all grades of natural tubes, preferably free from valves. Some inquiries from China for air brake hose have also been received, it was further reported.

Following are dealers' buying prices for scrap rubber in carload lots delivered to mills at points indicated:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$13.00	$13.00
S.A.G. passenger (natural)	nom.	nom.
Truck (natural)	nom.	nom.
Peelings (natural), No. 1	50.00	50.00
No. 2	31.00	31.00
No. 3	29.00	29.00
	(¢ per Lb.)	
Mixed auto tubes	4.25	4.25
Red passenger tubes	7.25	7.25
Black passenger tubes	5.00	5.00
Truck tubes	4.75	4.75
Mixed puncture-proof tubes	0.50	0.50
Air brake hose	nom.	nom.

RECLAIMED RUBBER

CONDITIONS in the reclaimed rubber market during April showed no change from those during March. Sales were high, although showing some decline from the levels set during February. The outlook continues optimistic, and some increase in demand for reclaim is also expected to result from the introduction and promotion of second-line tires. Production and export figures for reclaimed rubber continued at high levels.

Final January and preliminary February statistics on the reclaimed rubber industry are now available. Production of reclaim during January totaled 25,634 long tons; consumption, 25,885 long tons; exports, 768 long tons; and month-end stocks, 36,307 long tons. Preliminary figures for February show a production of 23,625 long tons; consumption, 22,017 long tons; exports, 1,273 long tons; and end-of-month stocks, 38,009 long tons.

There were no changes in reclaimed rubber prices during March, and current prices are listed below:

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8 / 8.5
Peel	1.18-1.20	9 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.25
Red	1.20-1.22	13.5 /14
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

COTTON AND FABRICS

New York Cotton Exchange
Week-End Closing Prices

Futures	Feb. 28	Mar. 27	Apr. 3	Apr. 10	Apr. 17	Apr. 24
June	32.61	34.58	35.33	36.50	37.26	37.70
Aug.	31.43	33.43	33.96	35.02	35.77	36.03
Oct.	29.73	31.55	31.98	32.72	33.52	33.43
Dec.	29.32	30.86	31.22	31.95	32.80	32.58
1949						
Mar.	29.11	30.64	30.96	31.75	32.59	32.25
May	28.88	30.34	30.63	31.42	32.24	31.91

THE cotton market showed a marked advance during April, with prices reaching new highs for the season. Influencing the advance earlier in the month were extensive purchasing and fixing for sales to China, the expectation of heavy buying under ERP, strong mill demand in expectation of higher prices under ERP, and reports of unfavorable weather in the cotton belt. Later in the month added support came from reports of a French bid for 1,850,000 bales, a German bid for 40,000 bales, and approval by the House Agricultural Committee of a bill extending parity and price support until 1950. Toward the end of April prices fell off somewhat as profit-taking made itself evident. Other bearish factors at the close of the month were rumors that ECA nations would keep out of the market until the new crop appears or until prices have been driven down, and fears that the semi-private Japanese credit deal might be delayed.

The 15/16-inch cotton middling spot price was 36.52¢ on April 1, advanced steadily to reach the monthly high of 39.63¢ on April 21, fell off somewhat thereafter, and closed the month at 38.55¢. July futures prices showed the same trend, opening the month at 34.90¢, reaching 38.05¢ on April 21, and closing the month at 37.17¢.

The ECA cotton buying schedule calls for the shipment of 748,000 bales to the nations involved during the next three months. Under the schedule the United Kingdom would get 202,000 bales; France, 172,000; Italy, 123,000; Be-ne-lux, 88,000; Western Germany, 75,000; Sweden and Austria, 22,000 each; Greece and Denmark, 9,000 each; and Norway, Portugal, and Ireland, 4,000 each. All of this cotton would presumably be from the old crop, with new crop buying details still to be announced.

On April 21 the Export-Import Bank announced that it will join with three private banks in making a $60,000,000 loan to finance shipment of American cotton to Japan. It is estimated that this amount of money will buy about 300,000 bales of cotton. Japanese mills are to make textiles from this cotton, and 40% of the cloth produced will be consumed in Japan, and the remainder sold in Japan's prewar export markets. The chances of the revolving fund legislation now before Congress, which would also supply money for the purchase of cotton by the Japanese, are not believed to have been altered by the approval of the credit loan.

On April 19 the Census Bureau reported that cotton consumed during March totaled 878,714 bales of lint and 103,751 bales of linters, as compared with 785,231 and 97,921 bales, respectively, consumed during February. Consumption for the eight months ending March 31 totaled 6,301,316 bales of lint and 779,478 bales of linters, compared with 6,928,094 and 664,696 bales, respectively, for the 1947 period.

Fabrics

The cotton fabrics market showed renewed activity during April, based on expectations of ERP buying and the imminency of the entry of the government into the wide industrial market. Industrial spokesmen said that for the present, and unless the government bought industrial wide cotton gray goods on a war basis, the mills could handle the civilian demands with ease.

Moderate third-quarter business was booked in fair amounts in certain categories, namely, the wide ducks, numbered ducks, and in certain constructions for the plastics trade for use in lamination. Third-quarter drills and twills were moving in moderate quantities, with occasional fourth-quarter sales made in drills.

In the sheeting line, more and more loom shifts were made from sheeting fabrics to other cloths such as drills and twills as the sheeting market became progressively dull. There was good activity in the osnaburg market, particularly in the 40-inch 40x26 2.11-yard construction which sold for nearby delivery at 25-26¢. Demand rose for class A print cloths in the lower counts for both nearby and forward delivery, although the rest of the print cloth market showed no outstanding feature.

Cotton fabric prices generally held firm last month despite the marked advance of raw cotton prices. It was generally believed in cotton mill circles that gray goods prices would probably hold at their present levels unless raw cotton for nearby delivery should reach the 40¢ mark, when a revision of fabric prices would be in order.

RAYON

SHIPMENTS of rayon during March totaled 90,800,000 pounds, 10% above the February level; deliveries of rayon during the first quarter of this year amounted to 264,600,000 pounds, or 18% above those of the corresponding 1947 period. Filament yarn shipments during March were 67,900,000 pounds, consisting of 46,300,000 pounds of viscose and cupra and 21,600,000 pounds of acetate; while staple deliveries totaled 22,900,000 pounds and consisted of 15,500,000 pounds of viscose and cupra and 7,400,000 pounds acetate. Shipments of filament yarn during the first quarter totaled 198,900,000 pounds, of which 133,400,000 pounds were viscose and cupra and 65,500,000 pounds were acetate. First quarter shipments of staple consisted of 44,500,000 pounds viscose and 21,200,000 pounds acetate, for a total of 65,700,000 pounds. Rayon stocks held by producers at the end of March totaled 14,200,000 pounds and consisted of 5,400,000 pounds viscose and cupra yarn, 3,400,000 pounds acetate yarn, and 5,400,000 pounds of staple.

The 1947 production of all types of tire fabric and cord reached a new high of 575,000,000 pounds, exceeding 1946 figures by 10% and being over twice the 1939 output. The output of both cotton and rayon tire products set new records. Production of cotton tire fabric and cord during 1947 amounted to 345,000,000 pounds, including chafer fabric, and was 11% above 1946 levels and 33% above 1939 output. The production of rayon and nylon tire fabric and cord at 230,000,000 pounds was 8% above that of 1946 and 25 times the 1939 level. In 1939 rayon constituted about 3% of total tire cord and fabric production, but in 1947 rayon and nylon together accounted for 40% of the tire fabric and cord market.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Baldwin Rubber Co.	Com.	$0.50 ext.	Apr. 26	Apr. 15
Baldwin Rubber Co.	Com.	0.15	Apr. 26	Apr. 15
British Rubber Co. of Canada, Ltd.	Pfd.	1.25 q.	Apr. 30	Apr. 15
Carborundum Co.	Com.	0.50 q.	Mar. 31	Mar. 17
Collyer Insulated Wire Co., Inc.	Com.	0.25	May 1	Apr. 24
Crown Cork & Seal Co., Inc.	Pfd.	0.50 q.	June 15	May 21
Crown Cork & Seal, Ltd.	Com.	0.50 q.	May 15	Apr. 21
Dayton Rubber Co.	Com.	0.30 q.	Apr. 26	Apr. 12
Dayton Rubber Co.	"A"	0.50 q.	Apr. 26	Apr. 12
Detroit Gasket & Mfg. Co.	Com.	0.12½	Apr. 26	Apr. 12
Firestone Tire & Rubber Co.	Pfd.	1.12½ q.	June 1	May 15
Goodall Rubber Co.	Com.	0.15	May 15	May 1
Goodyear Tire & Rubber Co.	Com.	1.00	June 15	May 14
Goodyear Tire & Rubber Co.	Pfd.	1.25	June 15	May 14
Goodyear Tire & Rubber Co. of Canada, Ltd.	4% Pfd.	0.50 q.	Apr. 30	Apr. 10
Gro-Cord Rubber Co.	Com.	0.10	Mar. 31	Mar. 19
Lee Rubber & Tire Corp.	Com.	0.50 q.	May 1	Apr. 15
Midwest Rubber Reclaiming Co.	Com.	0.25 q.	May 1	Apr. 19
Okonite Co.	Com.	1.00 q.	May 1	Apr. 15
Swan Rubber Co.	Pfd.	1.20 q.	May 1	Apr. 22
S. S. White Dental Mfg. Co.	Com.	0.37½ q.	May 15	Apr. 30
Thermoid Co.	Pfd.	0.62½ q.	May 1	Apr. 23
Union Asbestos & Rubber Co.	Com.	0.17½ q.	July 2	June 10

United States Rubber Statistics for January, 1948

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		
	Production	Imports	Total	Consumption	Exports	Stocks
Natural rubber, total	0	76,783	76,783	56,165	334	129,331
Latex, total	0	3,781	3,781	2,009	0	6,896
Rubber and latex, total	0	80,564	80,564	58,174	334	136,227
Synthetic rubber, total *	37,974	1,121	40,549	43,003	416	60,322
†	1,454					
GR-S *	29,552	1,085	31,006	34,078	50	‡38,380
†	369					
Butyl *	5,871	36	5,907	5,420	1	13,698
Neoprene *	2,551	0	2,993	2,843	299	5,129
†	422					
Nitrile	643	0	643	662	66	3,115
Natural rubber and latex and synthetic rubber, total	39,428	81,685	121,113	101,177	750	196,549
Reclaimed rubber, total	25,634	0	25,634	25,885	768	36,307
Grand Totals	65,062	81,685	146,747	127,062	1,518	232,856

* Government plant production.
†Private plant production.
‡ Includes 32 tons shipped for export, but not cleared.
Source: OMD, United States Department of Commerce, Washington, D. C.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, Inventory—February-January, 1948-February, 1947

	1948				1947
	February	% of Change from Preceding Month	January	First Two Months	First Two Months
Passenger casings					
Shipments					
Original equipment	1,557,559		1,865,215	3,442,774	3,027,622
Replacement	2,350,936		2,804,753	5,155,689	8,769,084
Export	88,261		67,130	155,391	201,601
Total	4,016,756	−15.21	4,737,098	8,753,854	11,998,307
Production	5,109,722	−20.64	6,438,955	11,548,677	13,317,722
Inventory end of month	8,231,088	+16.34	7,074,922	8,231,088	2,949,202
Truck and bus casings					
Shipments					
Original equipment	441,992		464,553	906,545	1,033,310
Replacement	536,312		627,866	1,164,178	1,610,005
Export	111,275		89,509	200,784	216,632
Total	1,089,579	− 7.81	1,181,928	2,271,507	2,859,947
Production	1,275,672	− 9.65	1,411,967	2,687,639	3,105,654
Inventory end of month	1,940,861	+12.12	1,730,994	1,940,861	915,773
Total automotive casings					
Shipments					
Original equipment	2,019,551		2,329,768	4,349,319	4,060,932
Replacement	2,887,248		3,432,619	6,319,867	10,379,089
Export	199,536		156,639	356,175	418,233
Total	5,106,335	−13.73	5,919,026	11,025,361	14,858,254
Production	6,385,394	−18.67	7,850,922	14,236,316	16,423,376
Inventory end of month	10,171,949	+15.51	8,805,916	10,171,949	3,864,975
Passenger and truck and bus tubes					
Shipments					
Original equipment	2,018,995		2,326,510	4,345,505	4,051,866
Replacement	2,382,151		2,745,405	5,127,556	8,198,307
Export	104,171		80,548	184,719	351,572
Total	4,505,317	−12.56	5,152,463	9,657,780	12,601,745
Production	4,979,609	−20.02	6,225,651	11,205,260	15,515,789
Inventory end of month	9,656,977	+ 5.94	9,115,605	9,656,977	6,621,213

Note: Cumulative data on this report inludes adjustments made in prior months.
Source: The Rubber Manufacturers Association, Inc.

Financial

(*Continued from page 264*)

The Pharis Tire & Rubber Co., Newark, O., and subsidiary. For 1947: net profit, $358,874, equal to 85¢ each on 424,600 shares; net sales, $19,280,272; income and excise taxes, $2,707,316; current assets at year-end, $5,299,482, including $665,789 cash, current liabilities, $1,810,264. (No comparable figures for 1946 are available as Pharis adopted the calendar year for its fiscal year in 1947.)

Pittsburgh Plate Glass Co., Pittsburgh, Pa. First quarter, 1948: net income, $6,667,895, equal to 75¢ each on 8,939,622 capital shares, against $6,729,214, or 76¢ each on 8,899,622 shares, in the same months last year; net sales, $66,731,935, against $62,589,324.

Plymouth Rubber Co., Inc., Canton, Mass. Quarter ended February 29, 1947: net profit, $115,800, equal to 13¢ a common share.

Raybestos-Manhattan, Inc., Stratford, Conn., and domestic subsidiaries. For 1947: net income, $2,335,755, equal to $3.72 a share, compared with $1,651,187, or $2.63 a share, the year before; sales, $58,308,929, against $51,985,801; taxes, $2,890,679, against $2,493,520; current assets, end of 1947, $19,801,858, current liabilities, $5,475,237, against $20,209,418, and $5,830,957, respectively, the end of 1946.

St. Joseph Lead Co., New York, N. Y., and domestic subsidiaries. For 1947: net earnings, $12,537,761, equal to $6.35 a share, (both record figures), compared with $5,807,131, or $2.94 a share, in 1946; net sales, $76,609,999, against $49,494,515; income taxes, $4,479,658, against $1,923,373.

Scovill Mfg. Co., Bridgeport, Conn., and subsidiaries. For 1947: net income, $4,318,005, equal to $3.31 a common share, against $3,236,703, or $2.61 a share, the year before; net sales, $76,956,232, against $62,917,225.

Seiberling Rubber Co., Akron, O., and including Seiberling Rubber Co. of Canada, Ltd. For 1947 (when production was cut by strikes for the first time in the company's 26-year history): consolidated net profit, $421,614, equal to 58¢ a common share contrasted with $1,124,141, or $3 a share, in 1946; net sales, $32,116,490, against $33,275,546; total current assets at end of 1947, $11,291,717, current liabilities, $4,621,658.

Seiberling Rubber Co. of Canada, Ltd., Toronto, Ont. For 1947: net profit, $166,050, against $80,803; current assets, $1,749,893, current liabilities, $673,851, at end of 1947, against the respective figures of $1,399,056 and $385,660 on December 31, 1946.

Sun Chemical Corp., New York, N. Y. For 1947: net profit, $1,504,345, equal to $1.18 each on 1,196,283 common shares, against $1,464,706, or $1.15 each on 1,131,283 shares, a year earlier; sales, $36,645,774, against $29,045,533.

(*Concluded on page 295*)

Malayan Rubber Statistics

The following statistics for February, 1948, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W. C. 2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

	Sheet and Crepe			Latex, Concentrated Latex, and Revertex (Dry Rubber Cement)		
		Malayan Union			Malayan Union	
To	Singapore Export Proper	Trans-shipped	Direct Shipments	Singapore Export Proper	Trans-shipped	Direct Shipments
Argentine Republic	15	...	60	...	...	...
Australia	2,321	627	...	29	168	...
Belgium	241	228	721	...	28	15
Canada	944	100	1,941	...	...	...
Chile	165	...	...	...	...	...
China	302	...	...	...	...	...
Cyprus	3	...	...	...	...	...
Czechoslovakia	115	...	50	...	...	...
Denmark	183	25	163	5	...	...
Egypt	11	...	6	...	6	...
Eire	3	...	...	...	...	...
Finland	...	...	250	10	...	...
Formosa	171	...	...	...	...	...
France	863	133	1,532	95	54	106
Germany	1,547	501	3,331	...	30	97
Hong Kong	234	...	90	...	...	...
Italy	783	106	1,272	7	...	...
Japan	1,345	...	...	...	...	...
Mexico	262	45	230	...	6	...
Netherlands	2,196	285	987	19	...	...
New Zealand	249	148	...	10	17	...
Norway	30	...	20	5	6	...
Other British countries in Africa	2	...	...	...	...	...
Other countries in South America	63	...	100	...	...	...
Poland	235	...	273	...	...	...
Portugal	...	...	395	17	...	...
Russia	...	...	1,225	...	...	...
Sweden	771	26	560	...	13	2
Switzerland	124	...	...	...	...	...
Turkey	190	...	130	...	...	...
Union of South Africa	977	140	163	2	...	...
United Kingdom	4,676	1,845	6,368	1,230	36	102
U. S. A.	15,955	1,972	11,888	888	...	859
TOTAL	34,976	6,181	31,755	2,317	374	1,181

Foreign Imports of Rubber in Long Tons

Singapore Imports from	Dry Rubber	Wet Rubber (Dry Weight)
Brunei	132	4
Dutch Borneo	1,176	893
French Indo-China	2	...
Java	553	...
North Borneo	966	66
Other Dutch Islands	65	1
Rhio Residency	706	45
Sarawak	2,330	1
Siam	262	..
Sumatra	7,278	4,306
TOTAL	13,470	5,316

Federation of Malaya Imports from

Burma	559	80
Siam	674	62
Sumatra	740	767
TOTAL	1,973	909

Dealers Stocks

	Tons
Singapore	46,677
Penang & Province Wellesley	13,576
TOTAL	60,253

Port Stocks in Private Lighters and Railway Godowns

Penang & Province Wellesley	7,143
Port Swettenham	3,268
Si gapore	7,702
Teluk Anson	305
TOTAL	18,418

Production

Estate	28,529
Small holdings [est.]	22,121
TOTAL	50,650

Financial

(Concluded from page 292)

American Cyanamid Co., New York, N. Y., and subsidiaries. March quarter: net income, $2,130,110, equal to 78¢ a common share, against $2,530,225, or 92¢ a share, in the 1947 period; net sales, $48,229,373, against $44,908,496.

DeVilbiss Co., Toledo, O., and wholly owned subsidiaries. Three months ended March 31: net income, $133,173, equal to 44¢ each on 300,000 common shares, compared with $188,042, or 63¢ a share, in the like period of 1947; provision for federal taxes $84,200, against $148,000.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. First three months, 1948: net income, $30,195,371, equal to $2.46 a common share, compared with $30,833,673, or $2.60 a share, in the corresponding period of 1947.

Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. For 1947: net income, $2,049,861, equal to $1.37 a common share, contrasted with $1,560,464, or $1.04 a share, in 1946.

General Cable Co., New York, N. Y. Three months ended March 31: net profit, $1,072,799, equal to 46¢ each on 1,898,614 common shares, compared with $1,628,297, or 74¢ a share, in the 1947 months.

Koppers Co., Inc., Pittsburgh, Pa. Quarter ended with March, 1948: net income, $1,577,165, equal to $1.27 each on 1,125,825 common shares, against $1,499,-528, or $1.47 each on 915,550 shares, a year earlier; net sales, $42,452,053, against $35,-281,718.

Monsanto Chemical Co., St. Louis, Mo. First quarter, 1948: net earnings, $3,805,-588, equal to 85¢ each on 4,256,453 common shares, against $4,944,502, or $1.19 each on 3,961,693 shares, in the 1947 quarter; sales, $38,473,744, 6% above sales in the corresponding period last year.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. First three months, 1948: net profit, $18,154,148, equal to $3 each on 6,045,106 capital shares, contrasted with $6,210,355, or $1.26 each on 4,916,987 shares, in the like period last year; provision for federal taxes, $6,508,200, against $3,221,000.

Skelly Oil Co., Kansas City, Mo., and subsidiaries. Three months to March 31, 1948: net income, $8,960,029, equal to $9.13 each on 981,341 common shares, against $2,923,654, or $2.97 a share, in the 1947 quarter.

Struthers Wells Corp., Titusville, Pa. Year ended November 30, 1947: net income, $1,160,057, equal to $9.05 each on 113,079 common shares, compared with $122,360, or $1.12 each on 109,145 preferred shares, in the preceding fiscal year; net sales, $15,024,205, against $8,655,841.

Thermoid Co., Trenton, N. J., and subsidiaries. For 1947: net income, $963,-468, equal to $1.21 a common share, compared with $853,197, or $1.19 a share, the year before; net sales, $22,677,652, against $20,436,481; income taxes, $788,-329, against $583,456; current assets, $8,-594,105, current liabilities, $4,504,915, at year end, against $8,009,892 and $3,532,102, respectively, the end of 1946.

Thiokol Corp., Trenton, N. J. For 1947: net income, $96,780, contrasted with net loss of $55,427 in 1946; sales, $1,204,598, against $1,003,936; current assets at year-end, $760,264, including $408,881, current cash liabilities, $100,849, compared with $610,962, $224,474, and $56,510 respectively, the end of the preceding year.

U. S. Rubber Reclaiming Co., Inc., New York, N. Y. For 1947: net income, $229,270, equal to 54¢ a common share, against $243,817, or 64¢ a share, in 1946.

Union Carbide & Carbon Corp., New York N. Y. For 1947: net income, $75,-666,792, equal to $7.98 a common share, against $57,206,351, or $6.10 a share, in the previous year; net sales, $521,844,814, a record figure, against $414,988,315.

First quarter: net income, $23,019,722, equal to $2.42 each on 9,479,878 capital shares, contrasted with $19,185,107, or $2.04 each on 9,366,488 shares, in the first three months of 1947; net sales, $150,154,423, against $126,388,346; income taxes, $15,-412,655, against $14,444,600.

United States Rubber Co., New York, N. Y. First quarter, 1948: net income, $4,691,164, equal to $1.87 a common share; consolidated net sales, $130,536,932.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. For 1947: net income, $1,232,690, equal to $4.12 a share, against $1,508,097, or $5.04 a share, the year before; net sales, $19,343,319, against $19,786,223.

United States Imports, Exports, Reexports of Crude and Manufactured Rubber

Exports of Domestic Merchandise

	January, 1948	
	Quantity	Value
UNMANUFACTURED, Lbs.		
Chicle	74,248	$41,184
Balata	500	1,675
Synthetic rubber: GR-S	111,437	20,954
Butyl	2,250	878
Neoprene	669,774	217,473
Nitrile	147,250	60,922
"Thiokol"	300	140
Polyisobutylene	7,634	2,705
Reclaimed rubber	1,720,784	128,319
Scrap rubber	5,051,960	129,131
TOTALS	7,786,137	$603,381
MANUFACTURED		
Rubber cement ... gals.	46,851	$51,593
Rubberized fabric: auto cloth ... sq. yds.	133,251	74,377
Piece goods and hospital sheeting ... sq. yds.	93,988	76,894
Rubber footwear: boots ... prs.	25,870	79,402
Shoes ... prs.	13,420	26,389
Rubber-soled Canvas shoes ... prs.	98,150	149,966
Soles ... doz. prs.	19,601	44,919
Heels ... doz. prs.	44,497	33,992
Rubber soling and toplift sheets ... lbs.	107,713	38,662
Gloves and mittens ... doz. prs.	11,194	35,644
Druggists' sundries: water bottles and fountain syringes ... no.	36,065	21,520
Other products	....	206,549
Rubber and rubberized clothing	....	66,302
Balloons	....	120,555
Toys and balls	....	29,480
Bathing caps ... doz.	1,520	4,716
Rubber bands ... lbs.	1,374	1,720
Erasers ... lbs.	29,045	19,860
Hard rubber goods: battery boxes ... no.	41,183	34,696
Other electrical goods lbs.	67,077	36,923
Combs, finished ... doz.	3,513	3,606
Other products	....	23,265
Tire casings: truck and bus ... no.	106,545	4,144,818
Auto ... no.	88,130	1,209,219
Inner tubes, auto ... no.	100,714	370,949
Other casings and tubes, except auto ... no.	55,903	589,000
Solid tires: auto and truck ... no.	16,970	299,837
Other ... lbs.	215,757	117,472
Tire repair materials: camel back ... lbs.	79,606	21,254
Other ... lbs.	221,415	101,755
Rubber belting: auto fan belts ... lbs.	91,023	96,500
Other ... lbs.	1,909,714	1,669,091
Rubber and friction tape lbs.	68,301	46,906
Hose and tubing: garden hose ... lbs.	94,789	31,997
Other ... lbs.	680,230	491,622
Rubber packing ... lbs.	146,113	145,795
Rubber mats, flooring, and tiling ... lbs.	543,244	149,430
Rubber thread: bare ... lbs.	55,663	87,821
Textile covered ... lbs.	22,966	43,038
Gutta percha manufactures ... lbs.	2,459	3,745
Latex and other compounded rubber for further manufacture ... lbs.	320,164	170,525
Other rubber products	....	282,667
TOTALS	....	$11,254,371
GRAND TOTALS, ALL RUBBER EXPORTS	....	$11,857,752

Reexports of Foreign Merchandise

	Quantity	Value
UNMANUFACTURED, Lbs.		
Crude rubber	747,450	$206,103
Balata	4,816	3,227
TOTALS	752,266	$209,330
MANUFACTURED		
Rubber cement ... gals.	1,825	$2,023
Rubber shoes ... prs.	144	588
Druggists' sundries, other than syringes and water bottles	....	2,187
Tire casings and tubes, except auto ... no.	9	82
Rubber and balata belting ... lbs.	98	189
Hose and tubing, except garden hose ... lbs.	739	418
Rubber packing ... lbs.	328	136
Latex and other compounded rubber for further manufacture ... lbs.	47,520	14,000
Other rubber products	....	60
TOTALS	....	$19,683
GRAND TOTALS, ALL RUBBER REEXPORTS	....	$229,013

Imports for Consumption of Crude and Manufactured Rubber

	January, 1948	
UNMANUFACTURED, Lbs.	Quantity	Value
Crude rubber	171,859,361	$29,782,199
Rubber latex	9,250,213	2,044,850
Balata	124,575	35,973
Jelutong or Pontianak	1,078,321	289,506
Gutta percha	155,375	94,854
Chicle	772,597	620,314
Scrap rubber	516,435	8,560
TOTALS	183,756,877	$32,876,256
MANUFACTURED		
Tires: auto, bus, and truck ... no.	690	$5,129
Bicycle ... no.	2,670	3,491
Inner tubes ... no.	118	286
Rubber footwear: boots prs.	21,945	44,491
Shoes and overshoes prs.	10,401	15,768
Rubber-soled canvas shoes ... prs.	180	86
Rubber toys, other than balloons	....	63
Hard rubber products	....	2,969
Rubberized printing blankets ... lbs.	70	178
Rubber and cotton packing ... lbs.	242	197
Gaskets and valve packing	....	72
Molded electrical insulators	....	179
Rubber belting ... lbs.	501	1,944
Hose and tubing	....	148
Heels and soles ... lbs.	7,405	1,864
Substitutes, advanced lbs.	2,526,324	454,808
Soft rubber products, other than druggists' sundries	....	13,436
TOTALS	....	$545,009
GRAND TOTALS, ALL RUBBER IMPORTS	....	$33,421,265

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

Rims Approved and Branded by The Tire & Rim Association, Inc.

RIM SIZE	
15" & 16" D. C. Passenger	Mar., 1948
15x4.00E	32,484
16x4.00E	1,066,755
15x4.50E	16,675
16x4.50E	575,483
15x5.00E	352,153
16x5.00F	87,504
15x5.50F	184,978
16x5.50F	42,846
16x6.00F	11,982
16x4.00E—Hump	113,230
15x4.50E—Hump	16,637
16x4.50E—Hump	41,075
15x5.00F—Hump	6,602
15x4½-K	87,943
16x4½-K	162,986
15x5-K	476,791
16x5-K	550,925
15x5½-K	95,402
16x5½-K	20,310
15x6-L	207,320
16x6-L	84,438
15x6½-L	366,867
15x4½-K—Hump	524,891
15x5-K—Hump	304,698
15x5½-K—Hump	216,762
15x6-L—Hump	63,292
17" & Over Passenger	
18x2.15B	2,120
19x2.15B	4,856
18x4.00F	1,378
Flat Base Truck	
17x4.33R	12,570
20x4.33R	7,200
17x5.0	50,767
18x5.0	40,396
20x5.0	125,687
20x5.00R	6,882
15x5.00S	1,546
17x5.00S	54
18x5.00S	873
20x5.00S	86,778
24x5.00S	1,955
17x5.5	53,349
15x5.50S	3,917
20x5.50S	19,055
24x5.50S	540
15x6.0	547
17x6.0	3,727
20x6.0	457,305
20x6.00S	344,383
15x6.00T	1,867
18x6.00T	108
20x6.00T	64,127
24x6.00T	467
20x6.5	38,208
15x6.50T	1,305
18x6.50T	436
20x6.50T	100,764
20x7.0	29,811
15x7.00T	123
18x7.00T	118
20x7.00T	26,781
22x7.00T	1,753
15x7.33V	308
20x7.33V	34,455
22x7.33V	16,731
24x7.33V	3,148
20x7.5	41,130
22x7.5	6,780
24x7.5	3,034
20x7.50V	28,387
22x7.50V	10,156
24x7.50V	467
20x8.0	5,112
22x8.0	1,601
20x8.00V	12,311
22x8.00V	3,111
19x8.37V	1,624
20x8.37V	1,605
24x8.37V	2,216
24x10.00W	2,204
Semi D. C. Truck	
16x4.50E	19,953
15x5.50F	138,863
16x5.50F	96,502
15x6.00G	6,514
16x6.00G	9,037
16x6.50H	17,181
Tractor & Implement	
12x2.50C	66,066
12x3.00D	97,658
15x3.00D	72,214
16x3.00D	27,818
18x3.00D	2,500
19x3.00D	73,164
30x3.00D	172
36x3.00D	962
16x4.25KA	15,410
20x4.50E	25,164
36x4.50E	1,872
16x4.75KA	3,708
13x5.50F	1,171
18x5.50F	36,602
20x5.50F	41,936
24x5.50R	4,584
40x5.50R	594
24x6.00S	872
36x6.00S	2,411
36x6.00T	1,161
20x8.00T	1,162
24x8.00T	28,244
28x8.00T	4,256
32x8.00T	574
36x8.00T	4,756
W5-30	2,159
W5-40	2,827
W6-24	10,118
W7-24	27,426
W7-36	554
W8-16	1,977
W8-24	40,470
W8-32	3,818
W8-36	9,935
W9-24	7,572
W9-28	1,128
W9-36	1,048
W9-38	5,920
W10-24	3,671
W10-24(H)	1,323
W10-28	17,614
W10-38	7,368
W11-24	2,443
W12-26	852
DW8-38	232
DW8-42	1,184
DW9-38	25,341
DW10-38	32,967
DW11-26	625
DW11-32	613
DW11-38	17,129
DW12-26	5,468
DW12-30	9,836
DW12-34	3,227
DW14-28	917
DW14-30	1,427
DW16-26	1,288
Earth Mover	
24x11.25	656
24x13.00	1,084
32x13.00	58
24x15.00	993
25x15.00	804
29x15.00	41
25x17.00	130
29x17.00	473
33x17.00	20
29x19.50	1
33x19.50	63
33x22.00	202
TOTAL	8,433,245

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)
Allow nine words for keyed address.		*Replies forwarded without charge*

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS OPEN

PLANT MANAGER

Experienced man who can take full charge of operation, compounding, and development of a large rubber canvas footwear plant in the Orient. State qualifications, experience, salary, etc. Address Box No. 101, care of India RUBBER WORLD.

WANTED: TIRE CHEMIST—EXCELLENT OPPORTUNITY—AGgressive small organization needs competent man accustomed to make topgrade product: must have progressive ideas; all answers held strictly confidential. Address Box No. 106, care of INDIA RUBBER WORLD.

PIPE AND TANK LINING SUPERVISOR

Requires man with five years or more practical experience in the field. Must be familiar with all phases of the lining process. Capable of organizing a new department and assuming control after set-up. State education, experience, availability, salary requirements, etc., in first reply. Applications will be held in strict confidence. Address Box No. 110, care of INDIA RUBBER WORLD.

WANTED: EXPERIENCED FACTORY MAN FOR MEDIUM-sized plant manufacturing V-belts, Radiator Hose, and Electrical Insulating Tapes. Must have thorough knowledge of compounding and factory processing. Chemical background very desirable. Progressive company offers good future and can arrange living quarters. Give full particulars of education, experience, etc. Address HOLFAST RUBBER COMPANY, Atlanta 1, Georgia.

WANTED: JUNIOR RUBBER CHEMIST, CANADIAN RUBBER plant. Control and development work. Experience desirable. Unusual opportunity. Address Box No. 112, care of INDIA RUBBER WORLD.

SITUATIONS WANTED

REGISTERED PATENT AGENT: CHEMIST, TWO SCIENTIFIC degrees, extensive patent experience in chemical and mechanical arts, available for part-time work. Address Box No. 102, care of INDIA RUBBER WORLD.

CONSULTING WORK: CHEMISTRY, PHYSICS, ENGINEERING, organization, by an experienced CONSULTING ENGINEER. Address Box No. 103, care of INDIA RUBBER WORLD.

WANTED: POSITION AS COMPOUNDER OR ASSISTANT TO plant superintendent. Rubber experience—10 years in large tire company, 4 years in small molded goods plant. Address Box No. 104, care of INDIA RUBBER WORLD.

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BANBURY and W & P MIXERS
EXTRUDERS VULCANIZERS
HYDRAULIC PRESSES

For Quicker Action and Better Price Send Full Details and YOUR Price to

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6 Hubert Street New York 13, N. Y.

SITUATIONS WANTED (Continued)

MANUFACTURERS' AGENT—SALESMAN—SALES MANAGER—18 years' complete Mechanical Rubber Sales experience. Large lucrative, most desirable Industrial and Jobber following. Salary, drawing account, or commission to average $6,000.00 upwards. Age 39; college; single. Address Box No. 105, care of INDIA RUBBER WORLD.

RUBBER AND SYNTHETICS TECHNOLOGIST, 19 YEARS chief chemist in charge of development and quality control in lab. and plant. Diversified products include offset and newspaper press blankets, rollers, specialized fabric coatings, vinyls, diaphragms, synthetic shoe soling, oil-resistant industrial fabrics. Address Box No. 114, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

RUBBER MILL 36" TO 40", GOOD CONDITION, WITH MOTOR. Give full particulars, price, location. Address Box No. 108, care of INDIA RUBBER WORLD.

WANTED: ONE WIRE INSULATING MACHINE INCLUDING 1 Bead Winding Machine, 1 Pull-off and Festooner, 1—2½" Tubing or Insulating Machine. Address Box No. 109, care of INDIA RUBBER WORLD.

MACHINERY & SUPPLIES FOR SALE

FOR SALE: RARE NEW AND USED ITEMS AT SUBSTANTIAL DISCOUNTS—ALL SUBJECT TO PRIOR SALE

One Plantation Wash Line consisting of three 15¾" by 28" all-steel frame, full brass fitted rubber washers, and one 16" and 18" by 32" cracker—all new and unused. Will fit for group or individual drive as required. Low price, prompt shipment.

One Used 10½" Nagle Tread Tuber, double reduction cut spur gears, base extended for 100 H.P. 900 R.P.M. motor. 1st grade rebuilt.

One Late. Little used 20" and 48½" by 88" Farrel-Birmingham Horizontal Asbestos Sheeter complete.

One 110 G.P.M. 2,000-pound pressure Baldwin Southwark Vertical Triplex Pump 3½" by 14" single herringbone gears, with 150 H.P. 514 R.P.M. 440-volt slip ring motor and control—late model. Little used, rebuilt. Includes suction valve control.

Two 500 G.P.M. 1,500-pound pressure 1945 model, horizontal Triplex Pumps fully enclosed with or without 500 H.P. 6,600-volt squirrel-cage motors. These pumps used less than six months and equal to new.

16—15" O.D. - 11½" I.D. - 20-foot long 2,000-pound working pressure air bottles; never used.

1—72" diameter by 78" deep Adamson Vertical Pot Vulcanizer with quick-opening door, all steel construction, 125 pounds' pressure; practically new. Sacrifice price.

1—500 H.P. at 600 R.P.M. input 5 to 1 ratio Farrel-Birmingham 30" center Reduction Gear Encased Herringbone practically new.

Molding Presses:

One 48" side to side by 56" front to back 8-opening Molding Press, 4" openings steel hot plates, four 14" rams for 200 pounds' pressure. 1st grade rebuilt.

One 48" by 48" 5-opening Molding Press, cast-iron plates, 4" openings, four 12" rams for 2,000 pounds' pressure. 1st grade rebuilt.

One 52" side to side by 72" front to back 8-opening Molding Press, 3¼" openings, three 12" rams for 2,000 pounds pressure. 1st grade rebuilt.

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(*Classified Advertisements Continued on Page 299*)

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OTS Bibliography Reports on Rubber Products—XI

THE abstracts printed below are taken from the United States Department of Commerce's weekly publication, "Bibliography of Scientific and Industrial Reports." Copies of the complete reports, either on microfilm or as photostats, as indicated, may be obtained from the Office of the Publication Board, Department of Commerce, Washington 25, D. C.

The Impact Resistance of Natural and Synthetic Rubber. I. G. Farbenindustrie. PB-19312. June, 1935. Photostat $1; microfilm 50c. Tabulation of average values for two natural rubbers and seven synthetic rubbers under various conditions of treatment are given. (In German.)

Perduren H. I. G. Farbenindustrie. PB-17350. April, 1937. 22 pages. Photostat $2; microfilm 50c. This appears to be a set of directions for making Perduren H rubber mixtures of various properties. The properties of the mixtures are summarized in tabular form. (In German.)

Method for the Drying of Artificial Rubber. I. G. Farbenindustrie. PB-19317. September, 1941. 5 pages. Photostat $1; microfilm 50c. Artificial rubber obtained by emulsion polymerization can be dried without the danger of partial plasticizing if, in wet state, it is submitted to the influence of a high-frequency alternating electric field. The results of comparison between hot air and high-frequency drying are shown in detailed table. This patent application is written in German.

Method of Treatment of Aqueous Dispersion of Synthetic Rubber. I. G. Farbenindustrie. PB-19342. September, 1942. 6 pages. Photostat $1; microfilm 50c. In this patent application the claim is for a method of treating aqueous dispersions formed by the emulsion polymerization of butadiene hydrocarbons alone or mixed with other polymerizable substances. The dispersion is treated with oxygen or substances which produce oxygen. After treatment, the polymer is precipitated in and washed with reducing media. The product so prepared has better adhesive and mastication properties.

Method of Coagulating Aqueous Dispersions of Synthetic Rubber. I. G. Farbenindustrie. PB-19353. August, 1941. 4 pages. Photostat $1; microfilm 50c. In this patent application the claim is for a method of coagulating aqueous dispersions of synthetic rubber by treatment with carbonic acid and ionizable salts. (In German.)

Method for the Production of Rubber-Like Polymers. I. G. Farbenindustrie. PB-19316. June, 1942. 4 pages. Photostat $1; microfilm 50c. Use of small amounts of acrylonitrile or methacrylonitrile (up to 5% of the total weight of the polymerizable substances) considerably shortens the time of polymerization of mixtures of butadiene hydrocarbons alone or of mixtures of butadiene hydrocarbons with other polymerizable vinyl compounds. This patent application is in German.

Method of Preparing Artificial Rubber. I. G. Farbenindustrie. PB-19351. March, 1942. 4 pages. Photostat $1; microfilm 50c. In this patent application the claim is for the preparation of synthetic rubber by polymerizing a mixture of isoprene and a vinylethinylallylcarbinol in the presence of small amounts of acrylonitrile or methacrylonitrile in aqueous solution. (In German.)

Method of Preparing Soluble Artificial Rubbers. I. G. Farbenindustrie. PB-19318. January, 1942. 3 pages. Photostat $1; microfilm 50c. Easily soluble, especially ligroin soluble, high-polymeric rubber-like products can be obtained if mixtures of dienes and methacrylic acid esters are emulsion polymerized. Before, during, or after polymerization, high boiling solvents or swelling agents are added to the emulsion. This patent application is in German.

Vulkacit TR. I. G. Farbenindustrie. PB-19311. April, 1937. 3 pages. Photostat $1; microfilm 50c. This accelerator works best in mixture with sulfur and stearic acid. Further improvement can be achieved by addition of antioxidants. Several mixtures are indicated which can be used in the rubber and leather industry. (In German.)

Method of Preparing a Plastic, Easily Manufactured Synthetic Rubber. I. G. Farbenindustrie. PB-19352. May, 1942. 5 pages. Photostat $1; microfilm 50c. In this patent application the claim is for the preparation of a synthetic rubber by emulsion polymerization of butadiene hydrocarbons or mixtures of these hydrocarbons and other ploymerizable materials. The resulting rubber is coagulated by nitrous acid and, if necessary, by other precipitating agents or by high temperatures. (In German.)

Method of Preparing Vulcanization Accelerators. I. G. Farbenindustrie. PB-19350. August, 1942. 6 pages. Photostat $1; microfilm 50c. This patent application has the claim for preparing an accelerator by the reaction between a thiocarbonic acid polysulfide of the general formula $R-O-C(=S)-(S)_n-C(=S)-O-R$ (were R may be an alkyl, aryl, aralkyl, or cycloalkyl group, and $_n$ a number of at least 2), and a secondary aliphatic, araliphatic, or cycloaliphatic amine. The reation is to take place in the rubber mixture. (In German.)

Method for the Preparation of Vulcanizable Mixtures from Organic Film-Forming Materials. I. G. Farbenindustrie. PB-19346. March, 1941. 3 pages. Photostat $1; microfilm 50c. A patent application for a vulcanizable rubber or rubber-like mixture ranging from viscous to difficultly liquefiable consistency contains a polymer prepared by the polymerization of butadiene in the presence of inorganic halides. (In German.)

Vulkacit J, the New Accelerator for the Production of Safe Mixtures. I. G. Farbenindustrie. PB-19314. November, 1937. 15 pages. Photostat $1; microfilm 50c. Vulkacit J is a white crystal powder with a sp. gr. of 1.33 and a melting point of about 190° C. It is insoluble in water, very difficultly soluble in alcohol, difficultly soluble in petroleum ether, but soluble in warm benzene and chloroform. It is neutral in reaction and not hygroscopic. Vulcanization of mixtures containing Vulkacit J starts after 50-60 minutes at 110° C.; 10-12 minutes at 133° C.; and three minutes at 143° C. It has the same effect also in combination with other accelerators; in the course of further heating these other accelerators become more active. Numerous tables illustrate in detail the effect of such combinations. (In German.)

Manufacture of 1,4-Butynediol at I. G. Ludwigshafen, Including Manufacture of 1,4-Butanediol and Tetrahydrofuran, Precautions in Handling Acetylene, and Semi-Technical Preparation of 1,4-Butenediol. C. G. S. Appleyard and J. F. C. Gartshore. (BIOS Final Rpt 367, Item 22.) PB-28556. November, 1945. 134 pages. Photostat $9; microfilm $3. This report records an examination made in November 1945. Flow sheets, equipment diagrams, and production figures are included. The other parts of the Buna plant, acetylene generation, butadiene manufacture, and polymerization are not dealt with in this report.

Characterization of Butadiene Catalysts by X-Ray and Chemical Analysis. J. F. C. Gartshore and J. D. Rose. (BIOS Final Rpt 356, Item 22.) PB-28894. March, 1946. 7 pages. Photostat $1; microfilm $1. Dr. von Susich, I. G. Farben, Ludwigshafen, had studied the characterization of butadiene catalysts and claimed to have made a correlation between the performance of catalysts and their constitution, as shown by combined chemical analysis and X-ray spectrography. It is possible by this method to predict the remaining life and the yield which would be obtained from any given sample of catalyst. A test by this method required only one day instead of the one month required by the pilot-plant method. The causes of catalyst deterioration were given as: (1) disappearance of free phosphoric acid; (2) accumulation of resin upon the surface of the granules; and (3) increase of crystal size.

Polymers and Copolymers at I. G. Farben, Ludwigshafen, Supplemental Report. J. W. Livingston. (FIAT Final Rpt 607.) PB-34722. December, 1945. 16 pages. Photostat $2; microfilm $1. This report supplements PB-176 and PB-4287 and describes another visit to this plant in June, 1945. Some additional information was obtained regarding Buna S-3, Koresin, ethylbenzene derivatives including styrene, polystrene, and divinyl benzene, and on styrene catalyst and some brief research investigations.

General Summary of Production and Use of Reclaimed Rubber in Germany. United States Rubber Bureau and U. S. Office of Rubber Reserve. (OPB Rpt 1.) PB-28310. 10 pages. Mimeograph 10c. There seem to have been no large outstanding manufacturers of reclaimed rubber in Germany. Manufacturers of rubber goods produced some of their own scrap of tires, tubes, mechanicals, shoes, etc., and purchased additional supplies. No new techniques have been developed, and no outstanding plasticizers found for reclaiming Buna S scrap. Nor was there any evidence that very much research work had been done on this problem. Germany never did produce neoprene, and no effort was made to reclaim Perbunan. The three-roll Vogel refiner is described, and rollers are shown in a sketch. The reclaiming formulae contained in the report on Dunlop, Hanau, are given.

German Medical, Surgical, and Sundry Rubber Goods. United States Rubber Bureau and United States Office of Rubber Reserve. (OPB Rpt 33.) PB-28337. 27 pages. Mimeograph 25c. This report covers visits made to three German rubber plants, Continental (Hannover), Phoenix (Harburg), and Dunlop (Hanau). Brief descriptions appear on the types of Buna produced, compounding ingredients, heat softening practices, manufacture of Buna surgeon's and household gloves, manufacture of soft sponge, cellular hard rubber, catheters, surgical tubing, and sundry rubber goods. Formulae for these various products are listed.

Tropical Storage of Rubber and Neoprene. A. C. Hanson. (Rock Island Arsenal Lab Rpt 40-2983). PB-30824. June, 1940. 25 pages. Photostat $2; microfilm $1. This report gives only the initial physical properties of the rubber and neoprene stored in tropical climates. Tables show results of strips tested, from which data curves are plotted. Silver corrosion tests were made on each sheet, and the results shown in a photo.

I. G. Central Rubber Organization at Leverkusen. W. J. S. Naunton and others. (CIOS File XXXIII-19, Item 22.) PB-32161. May-June, 1946. 486 pages. Photostat $33; microfilm $10. Investigators concluded that these I. G. laboratories were probably unequalled. The various aspects of rubber research are described, including methods for determining polymer structures, study of polymerization conditions, synthetic rubber production, technical development and physical testing, experimental rubber factory, rubber lining department, and tire development and factory work. The appendix gives the factory layout, methods of testing polymers and tires, and discusses various plasticizers and special products. Tables, diagrams, graphs, and photographs are included.

Synthetic Rubber Desmodur "R". Walter Lee. (FIAT Final Rpt 722). PB-27521. January, 1946. 9 pages. Photostat $1; microfilm $1. This report discusses the development and use of Desmodur "R," a synthetic adhesive material used for bonding rubber to fabric in the manufacture of tires. It was made by I. G. Farbenindustrie at Leverkusen. It can be used on standard spreading machines; it is said to be nontoxic and not expensive. The material can also be used on rayon and nylon fabrics without shrinking or stiffening the cord appreciably. The formula for the dough, the process of dipping and the tests are given. Desmodur "R," moreover can be used for bonding rubber to metals and for many other miscellaneous uses.

The Behavior of Rubber at Low Temperatures. W. Kuch and G. Telschow. PB-36156. April, 1941. 35 pages. Photostat $2; microfilm $1. This report from the *Institut fur Werkstofforschung der Deutschen Versuchsanstalt fur Luftfahrt E. V.* discusses the elastic properties of a number of commercially known, as well as of new rubber compounds on the basis of tests made at temperatures down to −70° C. It is found that certain Buna-S compounds are more resistant than natural rubber. (In German.)

Aircraft Tire Design and Development in Germany. P. H. Watson and others. (BIOS Final Rpt 497, Item 25.) PB-34046. November-December, 1945. 66 pages. Photostat $5; microfilm $2. Four German airplane tire manufacturing plants were visited: Continental (Hannover), Phoenix (Harburg), Dunlop (Hanau), and I. G. Farben (Leverkusen). The report covers methods of designing, testing, and manufacturing aircraft tires. Tables, graphs, drawings, photographs, and appendices are included.

(To be continued)

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Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	February, 1948		February, 1947	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Balata . . . . . lbs.	....	....	1,807	$ 6,570
Crude rubber	1,258,086	$ 261,224	6,059,012	1,391,372
Latex . . . . . lbs.	228,662	66,651	139,933	56,290
Rubber, powdered and waste . . . . . lbs.	73,400	9,052	1,051,100	22,933
Recovered . . . . . lbs.	2,120,000	163,912	2,264,000	156,703
Synthetic and substitute . . . . . lbs.	278,000	88,948	404,800	98,453
TOTALS.	3,958,148	$ 589,807	9,920,652	$1,732,321
PARTLY MANUFACTURED				
Comb blanks of hard rubber	....	$ 1,034	....	$ 2,560
Hard rubber in rods or tubes . . . . . lbs.	38	63	5,875	9,894
Rubber thread, not covered . . . . . lbs.	5,185	6,247	4,506	3,886
TOTALS	5,223	$7,344	10,381	$16,340
MANUFACTURED				
Belting	....	$ 58,897	....	$ 56,822
Boots and shoes of rubber, n.o.p. . . . . . prs.	110,578	117,367	40,366	60,051
Canvas shoes with rubber soles . . . . . prs.	300	860	413	1,318
Cement	....	38,324	....	30,090
Clothing of waterproofed cotton or rubber	....	5,840	....	4,283
Druggists' sundries	....	30,115	....	36,065
Gaskets and washers	....	26,484	....	19,173
Gloves . . . . . doz. prs.	190	1,213	1,979	7,949
Golf balls . . . . . doz.	300	1,364	300	1,364
Heels . . . . . prs.	6,902	917	2,778	524
Hose	....	33,723	....	40,344
Hot water bottles	....	1,940	....	6,774
Inner tubes, n.o.p. . . . . . no.	2,111	4,362	798	2,674
Bicycle . . . . . no.	7,054	3,209	854	331
Liquid sealing compound . .	....	....	....	11,643
Mats and matting	....	38,626	....	46,051
Nursing nipples . . . . . gross	1,081	6,248	1,150	3,557
Packing	....	12,296	....	9,090
Raincoats . . . . . no.	372	920	3,504	14,101
Tires pneumatic, n.o.p. . no.	2,327	77,874	1,143	32,911
Bicycle . . . . . no.	4,335	4,487	1,040	1,340
Solid for automobile and motor trucks . no.	104	1,747	....	....
Other	....	5,180	....	3,038
Tire repair material	....	7,645	....	47,661
Other rubber manufactures	....	345,785	....	289,465
TOTALS.	....	$ 825,432	....	$ 726,619
TOTAL RUBBER IMPORTS.	....	$1,422,583	....	$2,475,280

Exports of Crude and Manufactured Rubber

	February, 1948		February, 1947	
UNMANUFACTURED				
Crude rubber . . . . . lbs.	3,439,253	$ 656,582	1,132,617	$ 215,394
Waste rubber . . . . . lbs.	803,800	9,789	1,301,700	17,927
TOTALS	4,243,053	$ 666,371	2,434,317	$ 233,321
PARTLY MANUFACTURED				
Soling slabs of rubber . . lbs.	....	$	19,011	$ 4,005
MANUFACTURED				
Bathing caps	....	$	....	$ 248
Belting, n.o.p. . . . . . lbs.	323,668	211,260	206,900	130,563
Belts, fan	....	9,086	....	4,757
Boots and shoes of rubber, n.o.p. . . . . . prs.	208,726	289,546	139,764	237,416
Canvas shoes with rubber soles . . . . . prs.	42,296	46,703	176,002	187,622
Clothing of rubber and waterproofed clothing . .	....	11,849	....	16,756
Heels	6,680	389	73,488	5,773
Hose	....	75,118	....	71,293
Inner tubes for motor vehicles . . . . . no.	26,976	72,084	49,867	126,062
Soles . . . . . prs.	200	28	9,772	2,252
Tires, pneumatic for motor vehicles . . . . no.	48,145	946,140	41,520	649,479
Other . . . . . no.	2,408	2,110	4,769	3,952
Wire and cable, copper, insulated	....	149,013	....	63,374
Other rubber manufactures	....	25,731	....	37,063
TOTALS.	....	$1,839,057	....	$1,536,610
TOTAL RUBBER EXPORTS	....	$2,505,428	....	$1,773,936

"A.S.T.M. Standards on Rubber Products (With Related Information)." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Paper, 6 by 9 inches, 574 pages. Price: members $3; non-members $4. This latest compilation of standards covers all the specifications and tests issued by Committee D-11 on Rubber and Rubber-Like Materials and grouped under specific product headings. Of the 82 specifications and tests included, four are new and 41 have been revised since the last printing in March, 1946.

INDEX TO ADVERTISERS

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